Original Article

Characteristics of Non-Syndromic Supernumerary Teeth in (a Group of Turkish) Children

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Abstract:

Introduction: The aim of this study was to investigate the prevalence, distribution, gender differences and characteristics of non-syndromic supernumerary (SN) teeth in children and adolescents.

Methods: In a 2 year cross-sectional study, a total of 16,986 patients aged between 6-14 years who visited our department between April 2014 and April 2016 were revised. 100 cases of supernumerary teeth were found. Patients with SN teeth were evaluated for demographic data (age and sex), location, morphology, classification and number of the SN teeth and related complications. The distribution rates of SN tooth types and the distribution of complications between sex and age groups were analyzed. Likelihood ratio test was used for statistical comparisons.

Findings: The prevalence of non-syndromic SN teeth was 0.59%. The mean age of cases included in the study was 13.88 years (65% male and 35% female). The most common type of SN tooth was conical type (50%), while the supplemental (29.6%), tuberculate (16.7%) and odontoma (3.7%) types were also found. 92% of the cases had one SN tooth. SN teeth were mostly located in the maxilla (95.6%) and were mostly unilateral (55.3%); followed by bilateral (23.7%) and midline (21.1%). There was no statistically significant difference between the distribution of SN teeth between males and females ($p>0.05$). At least one complication was found in 40% of the cases.

Conclusion: SN teeth can cause a variety of complications. Careful and early clinical and radiographic examinations in children are important in order to prevent complications of SN teeth.

Keywords: impacted tooth; supernumerary teeth; tooth abnormalities; dental anomaly; prevalence; pediatricpatients.

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Introduction:

Teeth with more than normal number of teeth are called supernumerary (SN) teeth. This is a dental abnormality, also called hypoerdontia, that affects the number of teeth (another number abnormality is hypodontia/congenital tooth agenesis). Traditionally, SN teeth are defined as teeth that originate from the odontogenic tissues of a dental lamina, consisting of more than a normal number in any type of tooth (1). It can be seen both in primary teeth and permanent teeth, and can be observed unilaterally or bilaterally in the maxilla, mandible or both. In more advanced versions, it occurs in multiple in both jaws,

and this is frequently encountered in syndromes such as Clediocranial dysplasia, (2). Gardner's syndrome,3 Incontinentia Pigmenti,4 which often accompanied by SN teeth.

Although the etiology of SN teeth has not been fully elucidated, both genetic and environmental factors play a role. There are several theories explaining the development of different SN teeth. According to the "dichotomy theory", a single tooth germ is divided into two, and two symmetrical or asymmetrical teeth are formed (5).

In addition, the type of SN tooth is divided according to the state of division of the tooth germ; when the tooth germ is divided into two equal parts, it causes the formation of two eumorphic teeth, also known as the "supplemental tooh". However, when the tooth is divided into two unequal parts, differently sized and shaped (heteromorphic) SN teeth can form. Another obvious etiological hypothesis is "atavism theory". According to this theory, while the number of teeth in our ancestors was higher in the past, the number of teeth decreased in time and its normal number decreased over time, and in some people, SN teeth can be found as an extension of the teeth we had in ancient times. Recently, SN teeth are thought to develop mostly with the "hyperactivity theory of the dental lamina" (6). Accordingly, with the induction of the hyperactivity of the dental lamina or its remnants, the dental papilla develops and then the enamel organ matures and a SN tooth is formed. In this theory, heteromorphic teeth are formed by the hyperactivity of the dental lamina residues and eumorphic teeth from the lingual extension of an additional tooth germ (7).

SN teeth can be classified according to different parameters. In the last classification in the literature based on the morphology, position, and direction of the SN teeth; they are classified into conical, tuberculate, supplemental and odontoma according to their shape; they are also classified into mesiodens, distomolar, paramolar and parapremolar according to their location.8 They can be positioned labially, buccally or palatally in jaws; can be vertical, horizontal or inverted. The treatment need may vary depending on the type of SN teeth, impaction and other factors. SN teeth can be clinically asymptomatic and may cause complications such as crowding, delayed eruption, midline diastema, dental caries, root resorption as well (9).

Hyperdontia constitutes approximately 1-3% of all dental anomalies,1 its prevalence in permanent teeth is reported to be 3.8% and the prevalence in primary teeth is 0.35-0.6% (10). The prevalence of SN teeth varies according to demographic factors, gender and race. Its prevalence in populations of Asian (11) and African (12) descent has been shown to be higher than that of the white race. SN teeth are most frequently found on the midline of the maxilla, and secondly the maxillary molar region (13).

In this study, it was aimed to investigate the prevalence of SN teeth in Turkish population and the characteristics of SN teeth in 100 cases.

Methods:

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This cross-sectional study was carried out between April 2014 and April 2016 at Istanbul University Faculty of Dentistry Department of Pedodontics. The study was approved by the Istanbul University Faculty of Medicine Clinical Research Ethics Committee (No: 2013/1068).

This study included children and adolescents aged 6-14 years who applied for a dental examination on the specified dates, who had SN tooth during routine dental examination, or who had impacted SN tooth during routine radiographic examination. Patients with any syndrome, cleft/lip palate, history of jaw fracture, endodontic treatment, tooth extraction, orthodontic treatment and radiographs with inadequte quality were exluded from the study. In addition, patients who had tooth loss due to dental trauma or dental caries were excluded from the study. Written informed consent was obtained from the individuals who volunteered to participate in the study, and intra-oral photographs were recorded within their permission.

Radiographic images was requested from patients with SN teeth during oral examination. Panoramic radiographies (Kodak 8000 Digital Panoramic Machine, Carestream Health, Inc., Rochester, NY, USA), intraoral radiographies (Kodak 2100 Intraoral Machine, Kodak, Atlanta, GA, USA) were taken with the same device. Clinical and radiographic findings were recorded by one observer (YK) for the absence or presence of SN teeth. SN teeth were classified according to their morphology, number, location and direction, and related complications were evaluated.

The families of the patients with SN tooth were also questioned in terms of the presence of SN tooth. Radiographic examination was performed for other family members who had SN tooth. Families were questioned in terms of consanguineous marriage.

Data analysis was performed using the statistical Package for the Social Sciences (SPSS) version 26 (IBM Corp, USA). Descriptive statistics of continuous and categorical variables such as gender, age, single of multiple SNs of cases were analyzed. In comparing difference of complication distributions among age groups, the alternative Likelihood Ratio Test was used because the prerequisitites required for the Chi Square Independence test were not met. The significance level was set as 0.05.

Findings:

This study was carried out among 100 cases who had SN teeth among 16,986 patients who applied to Istanbul University Faculty of Dentistry Department of Pedodontics. Accordingly, the prevalence of SN teeth in this patient group was found to be 0.59%.

The average age of the 100 cases included in the study was 13.88 years. 65% of the cases were boys and 35% were girls. While the most common type of SN tooth was conical type (50%); supplemental (29.6%), tuberculate (16.7%) and odontoma (3.7%) type of SN were also found. In most cases (92%), there is only one SN tooth. SN teeth were frequently localized in the maxilla (95.6%); they were mostly seen as unilateral (55.3%), then bilateral (23.7%) and midline (21.1%). As a result of clinical and

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radiographic examinations, 80.6% of SN teeth were vertical, 11.1% were horizontal and 8.3% were inverted. Approximately half (50.9%) of the SN teeth were fully erupted, while the rest was partially impacted (6.4%) and impacted (42.7%). Other descriptive findings obtained in the study are given in Table 1.

The most common type of SN tooth were conical type in mixed dentition (65.5%) and permanent dentition (44.3%) period. The types of SN teeth were not differed according to the dentition ($p>0.05$) (Table 2).

The conical type of SN tooth were 43.2% in girls and 53.5% in boys. There was no statistically significant difference between the distribution of SN teeth according to gender groups ($p>0.05$) (Table 3).

At least one complication was encountered in 40% of the cases. SN teeth mostly caused delayed eruption of adjacent teeth (52.8%), followed by ectopic eruption (25%), median diastema (13.9%) and malocclusion (8.3%) (Table 1) (Fig. 1). There was no statistically significant difference between complications types between mixed and permanent dentition ($p>0.05$) (Table 4).

In this study, 50 cases with SN tooth and 50 families with 50 SN tooth were questioned about consanguineous marriage. The percentage of consanguineous marriage between parents of the cases with SN tooth was 76% and the families with SN tooth was 74% (Table 5).

Discussion and Conclusion:

SN teeth are an uncommon developmental abnormality and can be seen in any area of the dental arch. SN teeth can be part of a genetic syndrome or can occur in healthy non-syndromic individuals. Theories such as atavism, dichotomy of the tooth germs, excessive growth of the dental lamina have been proposed, but the etiology has not been established yet (14). It has been reported that SN teeth are more common in permanent dentition, than primary and mixed dentition. In this study, intra-oral findings of 100 non-syndromic children with SN teeth were examined. It has been reported in the literature that the frequency of SN teeth is 0.1% to 3.8% compared to the general population (15–17). Within the scope of our study, the prevalence of non-syndromic SN teeth was found to be 0.59% in 16,986 pediatric patients. The prevalence of SN teeth was found to be higher (0.3-0.33%) than in two studies, (18,19) and lower than two other studies, (20,21) which were conducted in Turkey. The percentage of SN teeth in girls and boys was found to be similar in the study of Kara et al. ($p>0.05$) (18). It has been reported that SN teeth are more common in boys than girls in the literature (15,22–24).

After the tooth eruption, dental anomalies related to the crown of the teeth become detectable in the oral cavity. Studies have reported that SN teeth are detected in individuals between the ages of 5 and 70, but are most common in children between the ages of 7 and 10 (25–29). Esenlik et al.16 found that 69 of 2599 children between 6-16 years old had SN teeth with a prevalence of 2.7%. Similarly, Küchler et al.17 found the prevalence of SN teeth to be 2.3% among 1166 children examined between 6 to 12 years old. In this study, the frequency of non-syndromic SN teeth was

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found to be lower than 0.59% in 16,986 children aged between 6 to 14 years.

SN teeth can be found in any area of the jaws, and the anterior maxilla has been reported to be the most affected site in the literature (16,22,30–32). In this study, it was observed that most of the SN teeth were in the maxilla (95.6%) in accordance with the literature. The percentage of maxillary SN teeth was found higher than other studies (18,33,34).

When classified according to their morphology, SN teeth are divided into conical, tuberculate, supplemental and odontoma. It is stated that the most common SN tooth is of the conical type and it is generally seen among the maxillary central incisors as mesiodens. Tuberculate shaped SN teeth are mostly seen in permanent dentition and often interfere with tooth eruption. Supplemental type of SN teeth are found in both permanent and primary dentition (35). Ferres-Pedro et al (found that the most common type of SN teeth between the ages of 5-19 was conical type(22). (53.16%). Sharma et al (32). stated that the SN teeth were mostly encountered in children between the ages of 4 and 14, they were mostly seen in the central incisor region with a prevalence of 81.2% and that 30% of these SN teeth were of the conical type. According to the literature, it seems that the most common type of SN teeth in children is conical type. Similarly, the most common (50%) type of SN were found as conical type in our study.

SN teeth can be seen in the same individual as single or multiple (25). It has been reported that SN teeth are more frequently seen as single, and multiple forms of SN teeth usually occurs as two teeth (15,32). Multiple SN teeth are often found as part of a disease or syndrome.36 In this study, single SN tooth was found to be 92% of the cases; multiple SN teeth were found in 8% of the cases. This finding in the result of our study is consistent with the literature.

Among the main complications created by SN teeth in adjacent teeth and tissues are delayed eruption in adjacent teeth, impaction, midline diastema, loss of vitality, malocclusion, displacement/rotation of adjacent teeth, cyst formation, root resorption/dilaceration of adjacent teeth, and eruption towards nasal cavity (35). In our study, at least one complication was found in 40% of cases due to SN teeth. Delayed eruption of adjacent teeth (52.8%) was the most frequently detected complication. Then, it was determined as ectopic tooth eruption (25%), median diastema (13.9%) and malocclusion (8.3%) respectively. The remaining SN teeth (60%) were observed to be asymptomatic. Açıkgöz et al.36 reported that 75% of SN teeth were asymptomatic and most of the cases were diagnosed during routine clinical and radiographic examinations. Demiriz et al.,20 , showed that 67.3% of SN teeth were asymptomatic and impaction was the leading complication.

Two individuals who are the carriers of autosomal recessive disorders as a result of consanguineous marriage play a role in the transfer of this gene to the next generation. The rate of consanguineous marriage in Islam societes is quite high. Islam is the dominant religion in Turkey. It was observed that the parents of the children

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included in our study had 75% consanguineous marriage. Khan (37) found that there was a relationship between non-syndromic SN teeth and consanguineous marriage. Studies in Saudi Arabia (38) and Lebanon39 also found that consanguineous marriage was linked to SN teeth. In this study, patients with SN teeth and families were included in an equal number and questioned in terms of consanguineous marriage. Accordingly, the rate of consanguineous marriage between parents whose child had SN tooth (76%) and family members who had SN tooth (74%) were found to be similar. We think that such high level of consanguineous marriage might affect the emergence of dental anomalies such as SN teeth.

Today, cone-beam computed tomography (CBCT) is the modern imaging method in dentistry. However, two-dimensional radiograhps are still used in routine dental examination. It is seen that many studies on SN teeth used panoramic radiography archives retrospectively (18,20,21,35). In this study, two-dimensional radiographs (panoramic or intraoral) were used to diagnose SN teeth. CBCT was requested in patients when necessary for surgical operation. In a retrospective study on CBCT, the prevalence of mesiodens type SN teeth was found to be 5.04%. The researchers stated that the use of CBCT in dentistry is advantageous compared to two-dimensional radiographs because it gives detailed information on the subjects such as the location of the SN teeth and their relationship with neighboring anatomical structures (40).

It has been shown that children and adolescents are the most evaluated population for SN teeth in the literature. Most of the patients require surgical tooth extraction before the age of 18, and in some patients, asymptomatic SN teeth are followed up for years until they become symptomatic. In this study, it can be seen that complications related to SN teeth may develop in children and adolescents. Careful clinical and radiographic examination in children is important in order to prevent complications that SN teeth may cause, especially in the anterior maxillary region.

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Tables and Charts:

Table 1: Clinical features of SN teeth.

Variable	Group	Frequency (n)	Percentage (%)
Gender	Girl	35	35,0
	Boy	65	65,0

[DOR: 20.1001.1.23222913.2020.9.1.7.4]

Type	Conical	54	50,0
	Tuberculate	18	16,7
	Supplemental	32	29,6
	Odontoma	4	3,7
Number	One	92	92,0
	Multipl	8	8,0
Impaction	Fully impacted	47	42,7
	Partially erupted	7	6,4
	Erupted	56	50,9
Position	Vertical	87	80,6
	Horizontal	12	11,1
	Inverted	9	8,3
Complication	Yes	40	40,0
	No	60	60,0
Type of complication	Delayed eruption	38	52,8
	Malocclusion	6	8,3
	Ectopic eruption	18	25,0
	Diastema	10	13,9
Location	Maxilla	108	95,6
	Mandible	5	4,4
Symmetry	Unilateral	63	55,3
	Midline	24	21,1
	Bilateral	27	23,7

Table 2: Comparison of SN teeth between dentition groups.

N=108			SN Type				Test value	sd	p
			Conical	**Tuberculate**	**Supplemental**	**Odontoma**			
Dentition	Mixed dentition	n	19	4	5	1	4,312	3	,230
		%	65,5%	13,8%	17,2%	3,4%			
	Permanent dentition	n	35	14	27	3			
		%	44,3%	17,7%	34,2%	3,8%			

Likelihood Ratio Test p = 0.05

Table 3: Comparison of SN teeth between gender.

N=108	Type of SN				Test value	sd	p
	Conical	**Tuberculate**	**Supplemental**	**Odontoma**			

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Gender	Girl	n	16	7	13	1	1,416	3	,702
		%	43,2%	18,9%	35,1%	2,7%			
	Boy	n	38	11	19	3			
		%	53,5%	15,5%	26,8%	4,2%			
Likelihood Ratio Test					p = 0.05				

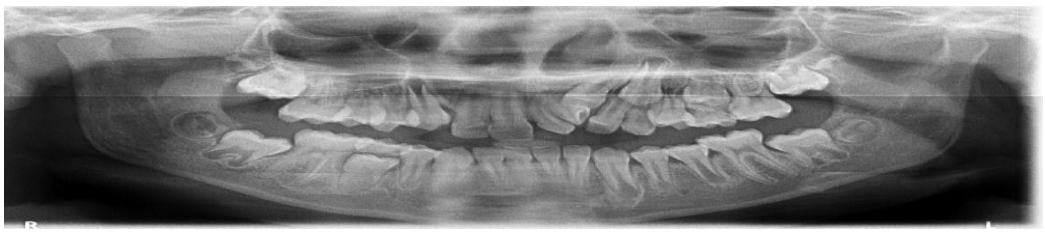
Table 4: Comparison of complication rates between dentition groups.

N=72			**Type of complication**				**Test value**	**sd**	**p**
			Delayed eruption	**Malocclusion**	**Ectopic eruption**	**Diastema**			
Dentition	Mixed dentition	n	9	3	4	4	2,631	3	,452
		%	45,0%	15,0%	20,0%	20,0%			
	Permanent dentition	n	29	3	14	6			
		%	55,8%	5,8%	26,9%	11,5%			
Likelihood Ratio Test					p = 0.05				

Table 5: The percentage of consanguineous marriage in parents of the cases with SN teeth. Case: SN tooth is seen only in cases, not in family members. Family: SN tooth is detected in at least 1 family member (sibling, mother or father of the child) as well as the child who is examined for SN teeth.

Presence of SN tooth	**Case**	50	50,0
	Family	50	50,0
Consanguineous marriage between parents of cases	Yes	38	76,0
	No	12	24,0
Consanguineous marriage between parents in families	Yes	37	74,0
	No	13	26,0

Figure 1: Impaction of tooth number 21 due to SN teeth.



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