

# Evaluation of panoramic radiographs taken from 1,056 Turkish children

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## Abstract

**Objective:** Panoramic radiographs (PRs) play an important role in the diagnosis and treatment planning of a wide range of dental and maxillofacial diseases and conditions. To examine and to determine the status of oral lesions, dental anomalies and pathologies in panoramic radiographs, which were taken at the department of pediatric dentistry, Dental School, Marmara University, Istanbul, Turkey.

**Materials and Methods:** This retrospective study consists of 1,056 randomly selected PRs of children aged from 4 to 12 years old, conducted at the department of pediatric dentistry at Dental School, Marmara University, between 5<sup>th</sup> December 2011 and 17<sup>th</sup> January 2012. The following information was obtained from the patients' records and PRs: Gender, age, presence or absence of oral lesions, dental anomalies and pathologies such as mesiodentes, supernumerary teeth, odontoma, radicular cyst, impacted tooth, and fusion.

**Results:** One thousand and fifty-six PRs from 520 girls and 536 boys were observed. The mean and standard deviation age of the patients was  $8.43 \pm 2.17$ . Among 1,056 patients, 457 (43.28%) of them had oral lesions, discovered by the PRs. The age of these 457 patients was ranged from 4 to 12 years. There were 37 (3.50%) mesiodentes, 9 (0.85%) supernumerary teeth, 4 (0.38%) odontoma, 12 (1.14%) radicular cyst, 16 (1.52%) impacted tooth, and 20 (1.89%) fusion.

**Conclusions:** Oral lesions with a rate of 43.28% could be detected relatively at early age, as presented in the present study. Early treatment of these lesions, dental anomalies, and pathologies could avoid maxillofacial deformity and other complications.

**Key words:** Children, oral symptoms, panoramic radiograph

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## Introduction

In the oral examinations, dental radiography is a popular and most frequently used diagnostic tool by dentists. Although radiographs are used frequently for caries detection, this technique is utilized for examination of traumatic injuries, disturbances in tooth development and growth as well. In addition to these, it is also used for detection of other pathological conditions.<sup>[1,2]</sup>

Panoramic radiography (PR) is a simplified extraoral procedure, which visualizes the entire maxillomandibular

region on a single film.<sup>[3,4]</sup> Since its introduction into the general practice of dentistry, PR has been used in the routine screening of patients at various institutions and private clinics, for allowing examination of the entire dentition, alveolar bone, temporo-mandibular joints, and adjacent structures at ease.<sup>[5-7]</sup>

Moreover, PRs play an important role in the diagnosis and treatment planning of a wide range of dental and maxillofacial diseases and conditions. In pediatric clinics, most pediatric dentists prefer to use PRs as

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their first choice because most children can tolerate it with no effort, based on having their noninvasive characteristic. Furthermore, it provides comprehensive information concerning the dentomaxillofacial region including erupted and unerupted teeth, developing tooth germs, and various dental abnormalities in both jaws. Thus, information obtained by these radiographic films and association with the clinical findings, assists the dentist to diagnose.<sup>[8]</sup> PRs provides easy observation of pathology and dental anomalies and lesions in the oral and maxillofacial region, besides, having occasionally directed to discover some incidental findings other than those involved in a patient's primary complaint.<sup>[9,10]</sup> The probability that a dentist can make incidental findings of pathology or anomalies in a patient, will be high if he/she has a special interest on the subject, because in many cases, such findings may require medical or odontological management.<sup>[11]</sup> This becomes especially important in children, because some delayed treatments in long-dated lesions and maxillofacial deformities, may develop some psychological problems. On top of it, dental anomalies are less common in the primary dentition than in the permanent dentition.<sup>[12]</sup> However, the prevalence rate of the recurrence, as well as the type of dental anomaly in the permanent dentition may vary.<sup>[13]</sup>

Despite these facts, some pediatric clinics do not routinely take the PRs of children at their initial visit.<sup>[6,14]</sup> On the other hand, few studies have been investigated in Turkey, on the subjects of the number of radiographs taken within the dental care for children and adolescents.<sup>[15,16]</sup> Also, it is evident that early detection of dental anomalies may help prevent oral diseases or dental anomalies in permanent dentition.<sup>[17-19]</sup>

The aim of this retrospective study was to examine and to determine the situation of oral lesions, and dental anomalies and pathologies by means of PRs.

## Materials and Methods

This retrospective study consists of 1,056 randomly selected PRs of children aged from 4 to 12 years old conducted at the department of pediatric dentistry at Dental School, Marmara University, between 5<sup>th</sup> December 2011 and 17<sup>th</sup> January 2012. This study was based on retrospective evaluation of radiographs. Thus, no ethical approval was obtained from the local ethical committee, since only the data achieved were used for the study.

The following information was obtained from the patients' records and PRs: Gender, age, presence or absence of lesions, dental anomalies and pathologies such as mesiodentes, supernumerary teeth, odontoma, radicular cyst, impacted tooth, and fusion.

A separate assessment of the radiographs was performed by three pediatric dentists (S Mete, G Ozbay, and B Kargul). To reduce radiographic misinterpretation, each examiner carefully studied the findings and verified them independently.

The diagnosis and inclusion criteria for the anomalies were made based on the descriptions presented by White and Pharoah.<sup>[18]</sup>

Assessment of the same digital PRs was performed directly on monitor screen. The images were exported and saved in Joint Photographic Experts Group (JPEG) file; and no adjustment of contrast, brightness, and magnification was performed by the three pediatric dentists. Statistical analysis of the data related to gender was undertaken using the Chi-square test.

## Results

One thousand and fifty-six PRs from 520 (49.24%) girls and 536 (50.76%) boys were observed. The mean age of the patients was  $8.43 \pm 2.17$ . The age distribution of the children is given in Table 1. Among 1056 patients, 457 (43.28%) of them had oral lesions detected by the PRs. The age of these 457 patients aged ranged from 4 to 12 years. Table 2 shows the age distribution of patients and those with oral lesions discovered in the PRs. Mesiodentes [Figure 1] were found in 37 children (3.50%), and supernumerary teeth in nine children (0.85%). Other important dental anomalies and pathologies were also detected as; 4 cases of odontoma [Figure 2; 0.38%], 12 cases of radicular cyst [Figure 3; 1.14%], 16 cases of impacted tooth (1.52%), and 22 cases of fusion (2.08%). The presence of fusion in

**Table 1: The age distribution of the patients**

	Total number (N)	The mean age $\pm$ SD
Total	1,056	8.43 $\pm$ 2.17
Girls	520	8.44 $\pm$ 2.15
Boys	536	8.43 $\pm$ 2.17

SD=Standard deviation

**Table 2: Age distribution of patients and those with lesions discovered in the panoramic radiographs**

Age	Number of patients		Number of patients with finding N
	N	%	
4	22	2.08	9
5	70	6.63	26
6	140	13.26	65
7	149	14.11	66
8	174	16.47	73
9	160	15.15	72
10	115	10.89	51
11	112	10.61	52
12	114	10.80	43
Total	1,056		457

the deciduous dentition was seen in 19 children, whereas the presence of fusion in permanent dentition was seen in 3 children. No statistically significant difference between gender and the frequency of each dental anomalies or pathologies by dentition ( $P > 0.05$ ) was found. The number of missing teeth was detected as 147 in 73 children. Among the 147 missing teeth, 32 of them were lateral incisors, 62 of them were lower premolars and 53 of them were upper premolars [Table 3].

## Discussion

Panoramic radiography has been widely used in screening and in epidemiological studies, because it is convenient to show a patient the jaws on a single film, by quick and simple procedure.<sup>[20-22]</sup> In oral examination, PRs can help to detect oral diseases, dental anomalies, or pathologies more earlier, so it is certain early detection of oral diseases or dental anomalies will results in better prognosis.<sup>[7]</sup>

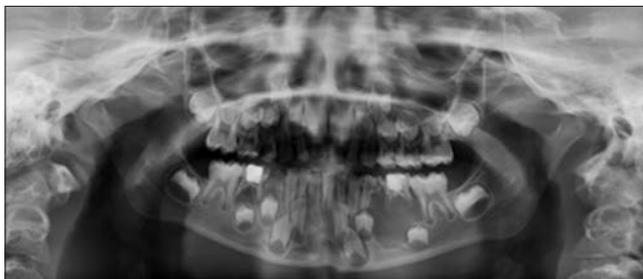
The factors leading to pathology and dental anomalies can be either genetic factors such as inheritance, metabolic, and mutations or environmental factors including physical,



**Figure 1:** Mesiodens between incisors



**Figure 2:** Odontomas on the left primary incisors



**Figure 3:** Follicular cyst on the left corpus of mandible

chemical, environmental, and biological factors. It is also possible that some of these anomalies are caused by a combination of both genetics and environmental factors.<sup>[2]</sup> Some of the pathology and dental anomalies are as follows: Apical osteitis, follicular cyst, alteration in number of teeth, extra or supernumerary teeth, missing teeth, dens in dente, dilaceration, taurodontism, malformations, and alterations in size of teeth.<sup>[21]</sup> Apart from clinical observations and examinations in diagnosing such anomalies, PRs also play an important role in the differential diagnosis of these anomalies.<sup>[14]</sup> Healthcare professionals, dentists in particular, rely on PR examinations, to assess the pathology and dental anomalies of their patients, and to refine their identification of the problems and the treatment plans.<sup>[5]</sup>

The prevalence of oral lesions, dental anomalies, and pathologies in different populations was the subject of several studies. In the present study, dental lesions as a whole, were found in 457 (43.28%) of the investigated sample.

Pekiner *et al.*,<sup>[15]</sup> evaluated 72 radiographs with oral lesions, dental anomalies, and pathologies which consist of 27 apical osteitis, 12 impacted teeth, 9 missing teeth, 7 follicular cysts, 8 fractured teeth, 3 mesiodentes, 3 supernumerary teeth, 2 taurodontism, and 1 deformed tooth.<sup>[15]</sup>

Another study investigated by Chen *et al.*,<sup>[19]</sup> comprised of 2,611 children (1,442 boys and 1,169 girls) between 2 and 6 years, in the primary dentition phase. The primary mandibular right lateral incisor was the most frequently missing tooth. The most frequently missing tooth was lower premolar in our study. There were no differences in the prevalence of anomalies between the genders, as in our study.<sup>[19]</sup>

Cholitgul and Drummond<sup>[20]</sup> reviewed to determine the prevalence of tooth and jaw anomalies from 1,608 children and adolescents aged 10 to 15 years (797 males and 811 females). Dental anomalies were detected on 21% of the radiographs (23% females and 17.3% males); 879 teeth were diagnosed with anomalies on 331 radiographs. The more common anomalies were found as malpositioned teeth, missing teeth, misshaped teeth, and teeth with hypoplastic appearance. This study demonstrates how PR is valuable in detecting or confirming dental anomalies, as we stated previously.<sup>[20]</sup>

Whittington and Durward<sup>[17]</sup> investigated primary and permanent tooth anomalies of 5-year-old children in Taranaki; 1,680 children were examined and six children had hypodontia, three children had a supernumerary tooth, and 14 children had double teeth. Six of the affected teeth were diagnosed as fusion and eight as gemination. For each type of anomaly, boys were affected more often than girls, which were contrary to our study findings. In the light of

the close relationship between primary and permanent dentitions, early identification of dental anomalies of the primary teeth can allow the dentist to investigate further and plan for appropriate treatment.<sup>[17]</sup>

Skrinjarić and Barac-Furtinović<sup>[23]</sup> analyzed 2,987 children from 3 to 6 years of age (1,582 boys and 1,405 girls). Hypodontia was found in 0.47%, hyperdontia in 0.10%, and double teeth in 0.43% of the total sample. Total prevalence of all anomalies in the sample was 1.0%. Symmetrical occurrence of hypodontia of primary teeth (i.e. in both sides of jaws) was significantly higher in boys (56.3%) than in girls (28.6%), in contrast to our study result. The most frequently missing primary teeth were maxillary lateral incisors (48.8%), followed by mandibular central incisors (34.9%), which were also close ratio findings to our study results.<sup>[23]</sup>

Asaumi *et al.*,<sup>[24]</sup> observed in 140 lesions of the 1,092 PRs (12.8%). The oral lesions involved 39 (59.1%) missing teeth, 20 (30.3%) mesiodentes, 4 supernumerary teeth, 1 odontoma, 1 radicular cyst and 1 impacted tooth. The missing teeth were observed in the central and lateral incisor, canine, and first and second premolar positions of both jaws; especially in the lower lateral incisor and upper central incisor positions and the findings were slightly different from our results.<sup>[24]</sup>

Ezoddini *et al.*,<sup>[25]</sup> carried out the study based on the PRs of 480 patients. Of these, 40.8% of the patients had dental anomalies. The common dental anomalies in the study were found as dilaceration (15%), impacted teeth (8.3%), taurodontism (7.5%), and supernumerary teeth (3.5%). Macrodontia and fusion were detected in a few radiographs (0.2%). Although in our study we could not find any difference between gender regarding to dental anomalies or pathologies, but Ezoddini *et al.*, found that 49.1% of male patients had dental anomalies compared to 33.8% of females.<sup>[25]</sup>

Rajab and Hamdan<sup>[26]</sup> investigated 152 children's age that ranged from 5 to 15 years. Supernumeraries were mostly detected by clinical examination and radiographs. Males were affected more than females, with a sex ratio of 2.2:1,

contrary to our findings. Seventy-seven percent of the patients had one supernumerary tooth, 18.4% had double teeth, and 4.6% had three or more supernumeraries.<sup>[26]</sup>

Peltola *et al.*,<sup>[27]</sup> study was based on PRs that were taken from 392 Estonian school children (33% boys and 67% girls) aged 14-17 years. The mean number of permanent teeth was 31.5. In 14% of the children, one to four teeth (excluding wisdom teeth) were missing. The frequencies of supernumerary teeth agreed with those in the literature, which is 3%, but our frequency of supernumerary teeth was found a little bit higher than this study result, which is 9%.<sup>[27]</sup>

Kirzioglu *et al.*,<sup>[28]</sup> determined 503 congenitally missing teeth in 192 patients (male = 93 and female = 99), excluding third molars. Twelve of these teeth were deciduous and 491 were permanent. A higher incidence of missing teeth was observed in girls than boys, in mandibular arch than maxillary as our study result stated.<sup>[28]</sup>

Bruce *et al.*,<sup>[29]</sup> examined the PRs of black children and found that 4.4% had congenitally missing teeth and 1.5% had supernumerary teeth.<sup>[29]</sup> Cholitgul and Drummond<sup>[20]</sup> reported a 21% prevalence of jaw and dental anomalies in the PRs of 1,607 children and adolescents, aged between 10 and 15 years, in New Zealand; their most frequent findings were missing and deformed teeth, contrary to our most frequent findings, which were oral lesions.<sup>[20]</sup>

Backman and Wahlin<sup>[22]</sup> detected one morphological anomaly in 18% and more than one anomaly in 8% of the Caucasian children aged 7 years, in North Sweden by clinical and radiological examinations. Their data indicated that prevalence of alteration in number of teeth, excluding the third molar was 1.9%.<sup>[22]</sup>

Sharma and Singh<sup>[30]</sup> investigated the children with supernumerary teeth. The results indicated that males were affected more than females with a sex ratio of 2.9:1. Fusion of supernumerary tooth with a regular tooth was observed in 4% of the patients and this result is a little bit elevated result than our study result, which is 1.89%.<sup>[30]</sup>

**Table 3: Age distributions of oral lesions**

Age	Missing teeth	Mesiodentes	Apical lesion	Supernumerary teeth	Odontoma	Radicular cyst	Impacted tooth	Fusion	N
4		2	6					1	9
5	6		18			1		1	26
6	10	4	50	1					65
7	13	3	32	2	1	1	9	5	66
8	13	10	37	1	2	3	1	6	73
9	13	5	46	4			1	3	72
10	1	5	36			2	4	3	51
11	3	5	39			3	1	1	52
12	14	5	17	1	1	3		2	43
Total (%)	73 (15 and 97)	39 (8,5 and 3)	281 (61 and 48)	9 (1,9 and 6)	4 (0,8 and 7)	13 (2,8 and 4)	16 (3,5 and 0)	22 (4,8 and 1)	457

Kazancia *et al.*,<sup>[16]</sup> showed that the frequency of mesiodens was 0.3%, with the ratio of boys (6 cases) to girls (4 cases) being 1.5:1; and this was not statistically significant ( $P > 0.05$ ), this result also confirms our study results.<sup>[16]</sup>

Although PR should be used as a supplement to the clinical examination, it has many advantages in oral examination such as; the broad coverage of teeth, low patient dose, and short development time with a single image of the facial structure, including both the maxillary and mandibular dental arches and their supporting structures.<sup>[14]</sup> However, diagnostic accuracy of anterior region on PR is lower than that of intraoral radiographs<sup>[9,29,31]</sup> using PR with selective intraoral radiographs in oral examination would give definitely better diagnostic accuracy; but this requires much more time and resources. Therefore, further researches are required to make balance between benefit, financial cost, and examination time.<sup>[7]</sup>

## Conclusions

In order to detect dental anomalies, pathologies, and oral lesions in the primary and permanent dentition, we conducted this study. Using PRs as a supplement to the clinical examination in national oral examination might enhance the public oral health. It can be concluded that the best timing for a PR is most useful in detecting problems and pathologies. The clinical signs about oral lesions and maxillofacial deformity might be used to support in considering this type of radiograph, which could avoid and prevent from other complications at later age.

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