

Original research article:

Prevalence and distribution of dental anomalies in Thanjavur district orthodontic patients: A retrospective study

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Abstract:

Aims and objectives: To evaluate the prevalence and distribution of dental anomalies in Thanjavur district orthodontic patients by panoramic radiographs.

Materials and Methods: A retrospective study of 980 subjects, aged 8 to 35 years was conducted to evaluate the panoramic radiographs from January 2017 to December 2019. The prevalence and distribution of the anomalies were assessed and reported as descriptive statistics.

Results: Among the 980 subjects (456 males and 524 females), a total of 405 individuals (41.32%) had developmental dental anomalies. The distribution by sex was 180 males (18.36%) and 225 females (22.95%). Impaction (18.4%) is the most common type followed by hypodontia(7.65%) , hyperdontia (5.81%) , ectopic eruption(4.18%).

Conclusion: The high frequency of dental anomalies in orthodontic patients emphasizes the need of early detection and diagnosis, which can be achieved through radiographic imaging, this would prevent dental problems and minimize treatment complexity.

Keywords: Dental anomalies, panoramic radiograph, prevalence, orthodontic patient

Introduction

Anomaly is a deviation from what is regarded as normal. The development of tooth depends on a complex reciprocal interaction between the epithelium and underlying ectomesenchyme. Any disturbance in this interaction process, can markedly alter the normal odontogenesis process leading to the development anomaly of teeth [1]. Dental anomalies may occur due to various factors, including environment and genetic influences [2]. Abnormalities of teeth size, shapes, structure, numbers, position and eruption are noted in disturbance of stages of odontogenesis process such as histodifferentiation and morphodifferentiation [3].

Dental anomalies can either occur as isolated cases or accompanied by systemic abnormalities constituting syndrome version [4,5]. Their incidence and degree of expression can provide important information for phylogenetic and genetic studies and help in the understanding of difference within and between population [6]. Several studies have investigated the prevalence of dental anomalies in various age groups and race. Worldwide, the prevalence of dental anomalies is ranged between 12 and 45% among the different population [7-10].

Teeth anomalies are more frequent in orthodontic patients than other dental patients and are usually associated with certain malocclusion [9,11,12]. Knowledge of the presence of such anomalies in orthodontic cases is extremely important in making diagnoses and treatment planning [13-15]. The results of numerous published

studies are conflicting, which were attributed to racial difference, variable sampling and difference in diagnostic criteria. The purpose of this study was to evaluate the prevalence and distribution of dental anomalies in the pre-treatment panoramic radiographs of orthodontic patients in Thanjavur district.

Materials and methods

The present study was approved by institutional review board, Thanjavur medical college and hospital. Pre-treatment digital panoramic radiographs of 1178 orthodontic patients between 8 to 35 years in Thanjavur district were retrospectively evaluated. All of the patients had been referred for radiographic examination at dental department in Thanjavur medical college, between January 2017 and December 2019. All the panoramic radiographs were examined on 19.5 inches computer monitor (Alldent HF Digital 850 W, 10Ma, Smart pan series) with resolution of 1600×900.

The inclusion criteria consisted of the subjects of 8 to 35 years of age with no significant medical history (such as trauma to the teeth, jaw bone fractures that affect the natural eruption, syndromes or metabolic disorders that affect the tooth formation and craniofacial anomalies), no crowns or large restorations that would interfere with the detection of some dental anomalies such as Taurodontism and no history of previous orthodontic treatment.

Exclusion criteria included patients with cleft lip and palate, ectodermal dysplasia and poor quality radiographic images were excluded from this study.

After applying the exclusion criteria the final sample obtained was of 980 (456 males and 524 females). Demographic data (Age and sex) of the patients were recorded. Panoramic radiographs were evaluated by the orthodontist. The following dental anomalies were assessed:

Size abnormalities: Microdontia, Macrodontia

Shape abnormalities: fusion, germination, dilacerations, taurodontism, dens evaginatus, dens invaginatus

Number abnormalities: Hypodontia, Oligodontia, Hyperdontia

Structural abnormalities: Amelogenesis Imperfecta, Dentinogenesis Imperfecta

Positional abnormalities: Ectopic eruption, Transposition, Impaction

Statistical analysis

Descriptive statistic (statistical package for social science: SPSS) was used to evaluate the prevalence and distribution of dental anomalies. Percentages and means were also calculated.

Results

The present study was performed for evaluation of prevalence and distribution of dental anomalies in the group of 980 pre- orthodontic treatment patients. Age ranged between 8 and 35 years. Among the 980 subjects (456 males and 524 females), a total of 405 individuals (41.32%) had developmental dental anomalies. The distribution by sex was 180 males (18.36%) and 225 females (22.95%). The distribution and prevalence of the developmental dental anomalies are shown in Table 1. Out of the total 980 patients, 252(25.71%) exhibited one anomaly, 65(6.63%) showed two anomalies and 4(0.40%) subjects displayed more than two anomalies (Table 7). Anomalies of position and number were the most common types of abnormalities, whereas anomalies of size and shape were the least common in both genders. Anomalies of impaction, hypodontia, hyperdontia and ectopic eruption were the most common subtypes of dental anomalies (Table 6). Except impaction, all other type of anomalies showed female predominance.

Size abnormalities

a) Microdontia

It was found that 13 out of 980 subjects had microdontia (5 males and 8 females, Table 1). The most common microdontia was the upper lateral incisor and second premolar.

b) Macrodonia

It was observed that 5 out of 980 subjects had macrodonia shown in Table 1. Lower lateral incisor was the most commonly affected tooth.

Shape abnormalities

Compared to Dens evaginatus, all other shape abnormalities such as fusion, gemination, dilacerations, Taurodontism and Dens invaginatus were observed, rare occurrence in this study. In this study 1.12% prevalence of Dens evaginatus was found commonly in upper and lower second premolars.

Number abnormalities

a) Hypodontia (missing tooth)

It was found that 75 out of 980 patients had missing tooth (males 22 and females 53, Table 1). The most common missing tooth was the upper lateral incisor (4.18%), followed by lower second premolar (1.73%), lower central incisor (0.91%), upper second premolar (0.51%) and lower lateral incisor (0.30%)(Table 5).

b) Hyperdontia (mesiodens and supernumerary tooth)

The most frequent hyperdontia was upper anterior teeth (4.59%) and other region such as upper and lower right and left posterior region showed equal occurrence (0.30%)(Table 3). Prevalence rate of hyperdontia in female is more compared to male.

Positional abnormalities

Prevalence of impaction (18.46%) was found highest in this study. The order of impacted teeth noticed in this study were upper canine(6.73%), lower canine(3.36), upper central(2.55) , lower second premolar(1.83%) and upper second premolar and lower second molar(1.12%) respectively (Table 2). The second most positional abnormalities were ectopic eruption (4.18%). The highest frequency was observed in upper first molar (2.24%)(Table 4).

Table 1: Prevalence and distribution of dental anomalies in study group			
Dental anomalies	Male (%)	Female(%)	Total(%)
Size abnormalities			
Microdontia	5 (0.51))	8(0.81))	13(1.32)
Macrodonia	4(0.40)	1(0.10)	5(0.51)
Shape abnormalities			
Fusion	1(0.10)	0(0)	1(0.10)
Gemination	0(0)	0(0)	0(0)

Taurodontism	0(0)	1(0.10)	1(0.10)
Dilaceration	2(0.20)	3(0.30)	5(0.51)
Dens invaginatus	0(0)	4(0.40)	4(0.40)
Dens evaginatus	3(0.30)	8(0.81)	11(1.12)
Number abnormalities			
Hypodontia	22(2.24)	53(5.40)	75(7.65)
Oligodontia	2(0.20)	1(0.10)	3(0.30)
Hyperdontia	21(2.14)	36(3.67)	57(5.81)
Position abnormalities			
Ectopic eruption	17(1.73)	24(2.44)	41(4.18)
Transposition	5(0.51)	3(0.30)	8(0.81)
Impaction	98(10)	83(8.4)	181(18.4)
Total	180(18.36)	225(22.95)	405(41.32)

Table 2: Prevalence and distribution of Impaction

Location	Male (%)	Female(%)	Total(%)
Maxilla			
Central incisor	16 (1.63)	9(0.91)	25(2.55)
Lateral incisor	2(0.024)	0(0)	2(0.20)
Canine	39(3.97)	27(2.75)	66(6.73)
First premolar	1(0.10)	0(0)	1(0.10)
Second premolar	5(0.51)	6(0.61)	11(1.12)
First molar	1(0.10)	0(0)	1(0.10)
Second molar	2(0.20)	3(0.30)	5(0.51)
Mandible			
Central incisor	2(0.20)	0(0)	2(0.20)
Lateral incisor	2(0.20)	3(0.30)	5(0.51)
Canine	18(1.83)	15(1.53)	33(3.36)
First premolar	0(0)	0(0)	0(0)
Second premolar	5(0.51)	13(1.32)	18(1.83)
First molar	0(0)	1(0.10)	1(0.10)
Second molar	5(0.51)	6(0.61)	11(1.12)
Total	98(10)	83(8.46)	181(18.46)

Table 3: Prevalence and distribution of supernumerary tooth			
Anatomical location	Male(%)	Female(%)	Total (%)
Maxilla			
Upper Anterior	13(1.32)	32(3.26)	45(4.59)
Upper right Posterior	2(0.20)	1(0.10)	3(0.30)
Upper left Posterior	2(0.20)	1(0.10)	3(0.30)
Mandible			
Lower Anterior	0(0)	0(0)	0(0)
Lower right posterior	2(0.20)	1(0.10)	3(0.30)
Lower left posterior	2(0.20)	1(0.10)	3(0.30)
Total	21(2.14)	36(3.67)	57(5.81)

Table 4: Prevalence and distribution of Ectopic eruption of teeth			
Anatomical location	Male(%)	Female(%)	Total(%)
Maxilla			
Upper lateral incisor	1(0.10)	0(0)	1(0.10)
Upper canine	1(0.10)	1(0.10)	2(0.20)
Upper second premolar	1(0.10)	2(0.20)	3(0.30)
Upper first molar	9(0.91)	13(1.32)	22(2.24)
Upper second molar	2(0.20)	1(0.10)	3(0.30)
Mandible			
Lower canine	1(0.10)	2(0.20)	3(0.30)
Lower second premolar	2(0.20)	3(0.30)	5(0.51)
Lower first molar	0(0)	1(0.10)	1(0.10)
Lower second molar	0(0)	1(0.10)	1(0.10)
Total	17(1.73)	24(2.44)	41(4.18)

Table 5: Prevalence and distribution of Hypodontia			
Anatomical location			
Maxilla	Male(%)	Female(%)	Total(%)
Upper lateral incisor	14(1.42)	27(2.75)	41(4.18)
Upper second premolar	2(0.20)	3(0.30)	5(0.51)
Mandible			
Lower central incisor	2(0.20)	7(0.71)	9(0.91)
Lower lateral incisor	1(0.10)	2(0.20)	3(0.30)
Lower second premolar	3(0.30)	14(1.42)	17(1.73)
Total	22(2.24)	53(5.40)	75(7.65)

Table 6: Prevalence order of dental anomalies		
Order	Dental anomalies	Cases(%)
1	Impaction	181(18.4)
2	Hypodontia	75(7.65)
3	Hyperdontia	57(5.81)
4	Ectopic eruption	41(4.18)
5	Microdontia	13(1.35)
6	Dens evaginatus	11(1.12)

Table 7: Frequencies of dental anomalies assessed from panoramic radiograph			
Frequency	Male(%)	Female(%)	Total(%)
One anomaly	113(11.53)	139(14.18)	252(25.71)
Two anomaly	23(2.34)	42(4.28)	65(6.63)
More than two anomalies	1(0.10)	3(0.30)	4(0.40)
Total	137(13.97)	184(18.77)	321(32.75)

Discussion

The most common abnormality found in this study was impaction (18.46%), which was consistent with the findings by Dalili et al (16.6%) [16], Patil et al (15.5%) [17], and Pedreira et al (21.4%) [11]. By contrast, higher prevalence rate were reported by shokri et al (45.5%) [18] and low prevalence rate were reported in Iran 3.41% [19] and in Italy 3.9%[20]. Impaction was observed more frequently in the maxilla than in the mandible. The most observed tooth was right maxillary canine.

Congenital absence of teeth results from disturbances during the initiation and proliferation stages of tooth formation. The term oligodontia refers to congenital absence of many but not all teeth, whereas hypodontia

represents absence of only a few teeth. As a general rule, implies one or a few teeth are missing, the absent tooth will be the most distal tooth of any given type and etiology for that is polygenic multifactorial [3].

The prevalence of hypodontia in this study was 7.65%, which was lower than that of the results of Weeraya Tantanapornkul (13.7%) [21] and Kositbowornchai et al (26.4%) [22]. Different population groups showed various range of prevalence rate of hypodontia such as 2.6% in Turkey[23], 5.5% in Mexico[24], 6.3% in Brazil[25], 8.5% in Japan[26], 11.1% in Korea[27], 13.7% in Thai[21] and 14.7% in Hungary[28]. The most common missing tooth in this study was upper lateral incisor (4.18%) followed by lower second premolar (1.73%), lower central incisor(0.91%) upper second premolar(0.51%) and lower lateral incisor(0.30%). Our study results were in accordance with study of Turkish, Indian, Mexican and Brazilian. Japanese population study results showed lower second premolar was most commonly missing tooth and Thai study showed lower incisor was most commonly missing tooth, these findings were inconsistent with our study results.

Supernumerary or extra teeth also result from disturbances during the initiation and proliferation stages of tooth formation. The most common supernumerary tooth occurs in maxillary midline and is called a mesiodens. The second most is lateral incisors and occasionally found in premolar region. The presence of supernumerary tooth obviously disrupt normal occlusal development and early intervention to remove it is usually required to obtain reasonable alignment and occlusal relationships [3].

The prevalence of supernumerary tooth in this study was 5.81%, which was higher than the study results of Uslu et al 0.3% in Turkey[15], Gupta et al 0.6% in India [29], Zhu et al 1% to 3% in white population[30]. In this study most common anatomical location of supernumerary tooth was upper anterior region which was concord with the results of Uslu, Gupta, Thonudomporn and Kositbowornchai. The prevalence of mesiodens noted in this study was 4.59%. But, Thai study noted prevalence of supernumerary tooth most commonly present in upper left posterior tooth (36.35%).

The most frequently found of microdontia was upper lateral incisor (1.32%) which was lower of Thai (7.21%), Altug- Atac AT et al, Thongudomporn et al[31] and Kositbowornchai et al. Macrodonia is a rare abnormality of teeth and very much less common than microdontia. In this study 0.51% were reported which was consistent with findings of Thai study 0.31%.

Eruption of teeth in wrong place due to malposition of a permanent tooth bud is called ectopic eruption. In this study, 4.18% of ectopically erupted teeth observed, which was lower rate reported by Gupta et al. The maxillary first molar was most commonly affected tooth, followed by maxillary canine.

Transposition is a rare dental anomaly which always found in permanent teeth, mainly in the region of canine and premolar and canine and lateral incisor. In this study, prevalence of (0.81%) reported, which were in agreement with study of Yilmaz [32], Thai and Kositbowornchai.

Distortion of root form is called dilacerations, and it occurs in traumatic condition during root formation. If distortion of root position is severe enough, it is almost impossible for the crown to assume its proper position, hence that conditions may require extraction or early reposition. The prevalence of dilacerations (0.51%) in this study was much lower than others (1.8%- 3.78%). The most common affected tooth with dilaceration in our study was upper central incisor but Thai study reported upper premolar.

Taurodontism is another rare dental anomaly observed in this study (0.10%), but higher prevalence were observed in Thai and Darwazeh et al [33]. Prevalence of Taurodontism was not observed in the study of Kositbowornchai et al.

The prevalence of dens evaginatus was found to be 1.12%, which was higher than the results of Dravidian and Nigerian population, which were 0.4% and 0.5% respectively[34,35]. It primarily affects the premolars but can also occur in molars, canines and incisors. In premolars and molars, dens evaginatus is usually seen on the occlusal surface. Gupta et al reported 2.40% which was slightly more than our study [29]. Early diagnosis of dens evaginatus is important to prevent teeth vitality during orthodontic treatment and alternative plan can be considered.

The prevalence of dens invaginatus was found to be 0.40% which was in agreement with the findings of Nigerian population[35]. Higher prevalence rate was reported in American 5% and Turkish population 1.3%. Although dens invaginatus is not common, there can be severe difficulties related to the tooth anatomy during endodontic treatment.

Conclusion

Dental anomalies such as impaction, hypodontia, hyperdontia and ectopic eruption were significantly higher prevalence rate observed in this study. Female predominance of overall distribution was noticed. Early detection of dental anomalies in orthodontic patients will prevent treatment complication and helps to decide alternative plan at an earlier stage. Further multicentre studies will improve to identify predominant dental anomalies prevalence in different place, gender and racial groups.

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