

Dental Anomalies among a Sample of Sudanese Orthodontic Patients

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Abstract

Background: Dental anomalies are not infrequently observed by the dental practitioner. They can seriously affect the patient's appearance and function. The aim of this study is to estimate the prevalence and distribution of dental anomalies in the permanent dentition of Sudanese orthodontic patients.

Materials and Methods: A descriptive cross sectional study was carried out for 1225 orthodontic patients orthopantomographs (265 male and 960 female) were screened for the presence of impaction, hypodontia, supernumerary teeth, Peg shaped lateral incisor, hypercementosis, taurodontism, odontoma and transposition. Pearson chi-square test was used to analyze the differences in the frequency of each dental anomaly by gender.

Results: At least one dental anomaly was reported in 291 patients (23.7%). Impaction was the most frequent one (11.1%), with canines being the most affected teeth, followed by congenitally missing teeth (8%) in which second premolars are the most commonly involved, supernumerary teeth (2.9%), peg shaped lateral incisors (2.6%), hypercementosis (0.5%), taurodontism (0.2%), odontoma (0.2%), and the least occurring anomaly, transposition (0.1%). No significant difference in dental anomalies was found between genders ($P < 0.05$).

Conclusion: The prevalence of dental anomalies in this study was within the range of that reported worldwide. Impaction was a predominant one. Careful diagnosis simplifies the treatment plan and reduces complications. Alternative treatment modalities can be planned and performed with a multidisciplinary team approach restoring the esthetics and function.

Key Words: Prevalence, Impaction, Supernumerary teeth, Agenesis, Peg shaped tooth

Introduction

Dental anomalies are defined as abnormal morpho-differentiation of teeth which occur during different stages of tooth development. Genetics are the most influential factors, in addition to some etiological events in the prenatal and postnatal periods during teeth morphogenesis that may lead to anomalies in tooth size, shape, position, number, and structure [1-4]. Worldwide, the prevalence of dental anomalies are range between 12% - 45% among different populations [5-9]. Extremely low prevalence 0.97% was reported among the Chennai population [10]. Tooth anomalies were more frequent in orthodontic patients than the general population, and were usually associated with certain malocclusions [11,12].

Hypodontia is defined as the failure of development of one or more teeth, is the most commonly occurring dental anomaly affecting the human dentition. Oligodontia is defined as missing more than six teeth, and anodontia is a complete absence of the teeth [3,7,13,14].

Hyperdontia or supernumerary, is a condition where the number of teeth is more than normal: Mesodens and supplemental teeth are the most frequent forms [14, 15].

Impaction is a delay in the time of tooth eruption with the expectation of incomplete eruption, according to the clinical and radiographic evidences [16,17]. The etiological factors may be lack of space, follicular cyst, retained deciduous teeth, supernumerary teeth, odontomas, and heredity [16].

A peg-shaped tooth is a condition commonly affecting the maxillary permanent lateral incisors [18].

Hypercementosis is a non-neoplastic condition in which excessive cementum is deposited, and the etiological factors may be idiopathic or environmental [14].

Taurodontism is a condition characterized by enlargement of the tooth body at the expense of the roots, with the bifurcation or trifurcation occurring near the apices of the roots [19].

Odontoma is a hamartomatous malformation rather than

a neoplasm. They are either complex or compound lesions, mainly located between the roots of erupted deciduous and permanent teeth of the anterior maxilla [14].

Transposition occurs when adjacent teeth switch positions. The etiology is unclear, may be due to heredity, migration of a tooth during eruption, or trauma [20].

The current study aims to determine the prevalence and distribution of dental anomalies in a sample of Sudanese orthodontic patients using orthopantomogram, which is an effective and useful diagnostic aid.

Materials and Methods

Pretreatment orthopantomograms of 1225 adults (18 to 45 years old) orthodontic patients (265 males and 960 females) were obtained from the patient records in the department of orthodontics, University of Khartoum, and private orthodontic clinics in Khartoum. Good quality orthopantomograms of patients of Sudanese nationality with no history of orthodontic treatment, extractions, trauma, or any syndromes that might have affected the normal growth of the permanent dentition were evaluated by the responsible observer retrospectively for the presence of the following dental anomalies:

- Impaction of teeth
- Hypodontia
- Supernumerary teeth
- Peg-shaped lateral incisor
- Hypercementosis
- Taurodontism
- Odontoma
- Transposition

Kappa statistics was used to evaluate the error of identification of each dental anomaly and Pearson Chi-square test was used for data analysis. The level of significance was set to be $p < 0.05$.

Results

Kappa value ranged from 0.857 to 1, which indicates perfect agreement between the first and the second evaluations.

At least one dental anomaly was observed among 291 (23.7%) orthodontic patients: 67 males and 224 females, and majority of patients 934 (76.3%) had no dental anomaly (Figure 1). The frequencies of observed anomalies among genders, and statistical differences, as well as the most frequently involved teeth, are shown in Table 1. Impaction and hypodontia were the most commonly occurring dental anomalies and transposition was seen only in one case.

Canine impaction in the maxilla was twice as in the mandible, and supernumerary teeth were observed more in the mandible as well. However, hypodontia was equally distributed in both jaws (Table 2). However, dental anomalies tended to occur more unilaterally among both genders as revealed in Table 3.

Maxillary canines were more commonly impacted among males with a statistically significant difference (Table 4), whereas hypodontia of maxillary second premolars were more significant among females (Table 5).

All of the studied anomalies were more frequent among

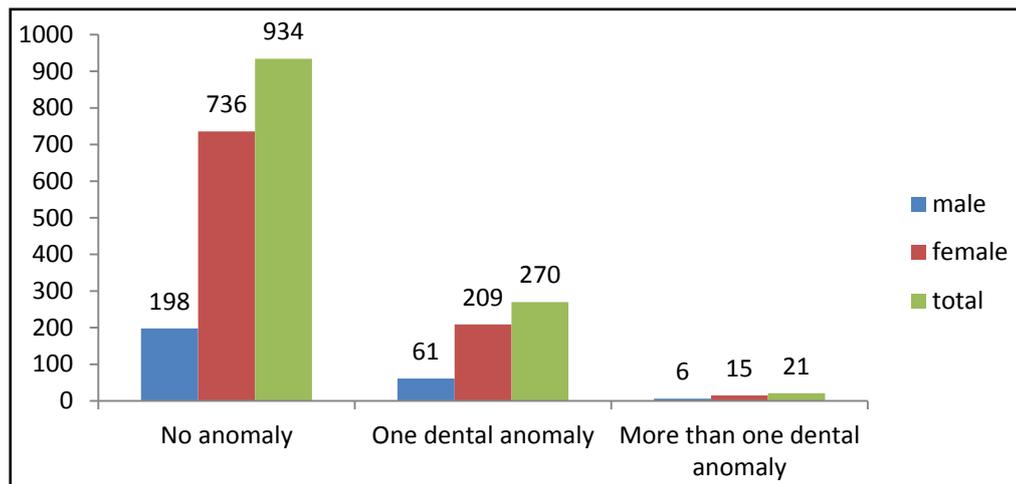


Figure 1. Distribution of dental anomalies among genders

Table 1. Distribution of dental anomalies among genders (%)

Dental anomalies	Male (265)	Female (960)	Total (1225)	P value	Most affected teeth
Impaction	36 (13.5)	100(10.4)	136 (11.1)	0.146	13,23,35,45,33
Hypodontia	19 (7.1)	79 (8.2)	98 (8)	0.574	45,25,15,35,12
Supernumerary	11 (4.1)	24 (2.5)	35 (2.9)	0.153	24,15,45,11,21
Peg shape lateral	8 (3.0)	24 (2.5)	32 (2.6)	0.639	12,22
Hypercementosis	1 (0.3)	5 (0.5)	6 (0.5)	0.76	34,45,44
Taurodontism	0	3 (0.3)	3 (0.2)	0.226	47,36,46
Odontom	0	3 (0.3)	3 (0.2)	0.226	11,21,35
Transposition	0	1 (0.1)	1 (0.08)	0.485	13,12

p ≤ 0.05 significant

Table 2. Distribution of dental anomalies in maxilla and mandible among genders.

Dental anomalies	Maxilla			Mandible			Both jaws		
	Male 265	Female 960	Total 1225	Male 265	Female 960	Total 1225	Male 265	Female 960	Total 1225
Impaction	23 (8.7)	62 (6.5)	85 (6.9)	12(4.5)	32 (3.3)	44 (3.5)	1 (0.3)	6(0.63)	7 (0.5)
Hypodontia	9 (3.4)	34 (3.5)	43 (3.5)	8 (3)	29 (3)	37 (3)	2 (0.7)	16 (1.7)	18(1.4)
Supernumerary	8 (3)	17 (1.8)	25 (2)	2 (0.7)	6 (0.63)	8 (0.6)	1 (0.3)	1 (0.1)	2 (0.1)
Peg shaped lateral incisor	8 (3)	24 (2.5)	32 (2.6)	0	0	0	0	0	0
Hypercementosis	0	0	0	1 (0.3)	5 (0.5)	6 (0.4)	0	0	0
Taurodontism	0	0	0	0	3 (0.3)	3 (0.2)	0	0	0
Odontom	0	2 (0.2)	2 (0.1)	0	1 (0.1)	1 (0.1)	0	0	0
Transposition	0	1 (0.1)	1 (0.1)	0	0	0	0	0	0
Dental anomalies	Maxilla			Mandible			Both jaws		
	Male 265	Female 960	Total 1225	Male 265	Female 960	Total 1225	Male 265	Female 960	Total 1225
Impaction	23 (8.7)	62 (6.5)	85 (6.9)	12(4.5)	32 (3.3)	44 (3.5)	1 (0.3)	6(0.63)	7 (0.5)
Hypodontia	9 (3.4)	34 (3.5)	43 (3.5)	8 (3)	29 (3)	37 (3)	2 (0.7)	16 (1.7)	18(1.4)
Supernumerary	8 (3)	17 (1.8)	25 (2)	2 (0.7)	6 (0.63)	8 (0.6)	1 (0.3)	1 (0.1)	2 (0.1)
Peg shaped lateral incisor	8 (3)	24 (2.5)	32 (2.6)	0	0	0	0	0	0
Hypercementosis	0	0	0	1 (0.3)	5 (0.5)	6 (0.4)	0	0	0
Taurodontism	0	0	0	0	3 (0.3)	3 (0.2)	0	0	0
Odontom	0	2 (0.2)	2 (0.1)	0	1 (0.1)	1 (0.1)	0	0	0
Transposition	0	1 (0.1)	1 (0.1)	0	0	0	0	0	0

Table 3. Distribution of dental anomalies unilateral and bilateral among gender (%).

Dental anomalies	Unilateral			Bilateral		
	Male (265)	Female (960)	Total (1225)	Male (265)	Female (960)	Total (1225)
Impaction	28(10.)	77(8)	105 (8.6)	8 (3)	23 (2.4)	31 (2.5)
Hypodontia	8(3.0)	50(5.2)	58 (4.7)	11(4.1)	29 (3.0)	40 (3.3)
Supernummary	8(3.0)	18(1.8)	26 (2.1)	3 (1.1)	6 (0.6)	9 (0.07)
Peg shape lateral	5(1.8)	10 (1)	15 (1.2)	3 (1.1)	14 (1.4)	17 (1.4)
Hypercementosis	1(0.3)	3(0.3)	4 (0.3)	0	2 (0.2)	2 (0.2)
Taurodontism	0	1(0.1)	1(0.08)	0	2 (0.2)	2 (0.2)
Odontom	0	2(0.2)	2 (0.2)	0	1 (0.1)	1 (0.08)
Transposition	0	1(0.1)	1 (0.08)	0	0	0

Table 4. Distribution of most common impacted teeth among gender.

Impacted tooth	Male (265)	Female (960)	Total (1225)	P
Canines	24(9.1)	61(6.4)	85(6.9)	0.125
Maxillary canines	17(6.4)	53 (5.5)	70 (5.7)	0.579
Mandibular canines	8 (3.0)	11 (1.1)	19(1.6)	0.029 *
Second premolars	8(3.0)	34(3.5)	42(3.4)	0.679
Mandibular 2nd premolar	5 (1.9)	25 (2.6)	30 (2.4)	0.770
Maxillary 2nd premolar	3 (1.1)	9 (0.9)	12(1.0)	0.761
Maxillary central incisor	4 (1.5)	6 (0.6)	10 (0.8)	0.171
Maxillary lateral incisor	1 (0.4)	3 (0.3)	4 (2.9)	0.323

* $p \leq 0.05$ significant

Table 5. Distribution of most common congenitally missing teeth among gender

Missing teeth	Male (265)	Female (960)	Total (1225)	P
Second premolars	10(3.8)	47(4.9)	57(4.7)	0.443
Maxillary second premolar	2(0.8)	30(3.1)	32(2.6)	0.032*
Mand.second premolar	8(3.0)	31(3.2)	39(3.2)	0.863
Lateral incisors	9(3.4)	27(2.8)	36(2.9)	0.618
Maxillary lateral incisor	8(3.0)	16(1.7)	24(2.0)	0.160
Mandibular lateral incisor	2(0.8)	14(1.5)	16(1.3)	0.372
First premolars	1(0.4)	3(0.3)	4(0.3)	0.870

females than males, however, no significant difference was observed.

Discussion

The results of the present study revealed that 23.8 % of the sample had at least one dental anomaly, which were in line with the results obtained by Hanglang among 500 Norwegian school children [21]. However, a higher percent was reported among Thai and Turkish orthodontic patients (38.6%, 40% respectively), [7,8] whereas a low prevalence was described by Sogra among Iranian orthodontic patients (12%), and Chennai (0.97%) [5, 10].

This variation in the results may be partially attributed to the ethnic backgrounds, sample sizes, and study populations; some authors study orthodontic patients whereas others study the general population. Moreover the third molars were not considered [5,6,8,21].

Impaction

Impaction was the most prevalent dental anomaly in the present study (11.1%), and canines were the most involved teeth [6.9%], followed by second premolars (3.4%), and mainly located in the upper jaw which is in agreement with previous studies among various populations [6,7,9,21-25].

A relevant study among Sudanese university students revealed low prevalence (2%) of canine impaction, which exists more in one side, rather than both sides of the jaws [24].

This is in line with the current study, in addition to another study conducted by Fardi among Greece population [23].

Numbers of authors showed more or less percentage of impaction than the current study. Saudi population 3.3%, [6] Indian population 3.1% [26]. The percentage of impacted canines (8.8%) among Greece population is in accordance with the present study [23].

Worldwide, a higher percentage of impaction had been reported than that which had been found in the current study; 13.7 % among 1239 Greek patients and 15.5 % among 1123 Indian population [9,23]. However, in Saudi Arabia, a much higher prevalence (21.1%) was found [6]. In contrast, Portuguese and Turkish studies showed a very low percentage (1.8% and 2.9% respectively) [7,25].

Concerning genders, no statistical difference was observed in the present study which is in agreement with Uslu, Haugland, and Maria [7,21,25] whereas Afify and Hou found that females were significantly more affected than males [6,27].

This variation in the results can be attributed partially to the sample sizes, type of the study samples, ethnic backgrounds and environmental factors.

Hypodontia

The present study revealed 8% of hypodontia which was similar to the results obtained by Endo among Japanese orthodontic patients (8.5%) and Fnaish among Jordanian patients 8.83% [28,29]. In contrast, relative Sudanese

studies showed less percentage [5.1%] of hypodontia among orthodontic patients and 2.6% among the general population [30,31].

Worldwide, low prevalence was reported in Norway 6.6% and India 4.19%, [9, 21] whereas high prevalence was reported among Thai orthodontic patients (26.1%), Saudi population (25.7%) and Indian patients (16.3%) [6,8,26].

The most frequently missing teeth were the second premolars 4.7% (mandibular 3.2%, maxillary 2.6%), followed by lateral incisors 2.9% (maxillary 2%, mandibular 1.3%). In contrast, previous Sudanese studies showed that the mandibular lateral incisor was the most commonly missing tooth among the general population, followed by the maxillary lateral incisor [30], whereas among orthodontic patients, the maxillary lateral incisor was the most frequently missing tooth 2.1% followed by the mandibular second premolar 1.7% [31].

Regarding the location, hypodontia was equally distributed in both jaws. However, among females it tended to occur more in a unilateral pattern (4%) than a bilateral one (2.3%) and vice versa in males. This result differs from previous Sudanese studies [31]. Hypodontia was reported more among females than males in the present study. However, no significant difference was observed which was in agreement with various studies. [6,7,9,29,30]. Nevertheless, some studies reported a higher prevalence in females, [5,21,32] while others reported more in males [10,26,33]. This divergence in the results may be attributed to the ethnic variation, study populations and sample sizes.

Supernumerary teeth

In this study the prevalence of supernumerary teeth was 2.9%, which was comparable with the finding by Kositbowornchai (2.7%) among Thai children [8]. In previous literature, less prevalence (0.13%, 0.3%, and 0.3%) had been reported among Chennai, Saudi, and Turkish populations respectively [6,7,10] whereas 4.5% was observed among 3660 Jordanian school children [29].

In the present study the supplemental teeth were the most common supernumerary tooth followed by mesodens, and it was mainly located in the maxilla and unilaterally, which is in accordance with previous studies among various populations [5,6,8,23,34].

Most of the studies in the literatures reported that males were significantly more affected than females [5,6,26,27]. However, in this study no statistical significant difference was observed among genders, which is in line with the results obtained by Francisco, Esenlik, Uslu, and Kositbowornchai [7,8,34,35].

Peg shaped lateral incisor

Peg shaped lateral incisors were observed among 2.6% of the current Sudanese orthodontic patients, which was in line with the results obtained among mongoloid (2.7%), Jordanian (2.35%) and Nigerian populations (2.3%) [18,36,37].

Conversely, a low prevalence (1%) was found among Iranian orthodontic patients [5].

Unilateral and bilateral Peg shaped lateral incisors were approximately equal in occurrence, which was in agreement with the results of Hua F. among a Chinese population [18]. Unilateral peg shaped lateral incisor was more common in males, whereas bilateral were more among females in the current study, although no significant differences were found. The same results had been recorded by Hau F among different ethnic groups [18].

Hypercementosis

This was an infrequent dental anomaly in the study (0.5%). A higher percentage had been recorded by Kositbowornchai (1.2%) among Thai orthodontic patients [8] and by Sebastian (1.33%) among a German population [38].

This low percentage of Hypercementosis among the general normal population further amplifies the fact that it is mainly associated with systemic diseases [38].

Taurodontism, Odontom and Transposition

Only 0.2% of taurodontism was reported in the present study. A slightly less percentage of taurodontism (0.18%) was reported by Sogra among Iranian orthodontic patients [5], and an even less percentage (0.1%) was found among Saudi Arabian and Turkish populations [6,7].

In contrast, a high prevalence (5.5%) was observed by Bronoosh among 510 Iranian patients [19].

Odontom was observed among 0.2% and transposition 0.1% in the present Sudanese sample, which is in accordance with Santosh's results among the Indian population [26] and less than the results obtained among Thai orthodontic patients (0.7%) [8].

This variation in the prevalence of dental anomalies can be partially attributed to differences in the study samples and sizes, environmental factors, age groups and ethnic backgrounds.

Conclusions

1. The prevalence of dental anomalies among orthodontic Sudanese patients was 23.8%. Impaction was the most common anomaly, mainly found in the maxilla (11.1%) followed by hypodontia (8%).
2. Hypercementosis, taurodontism, odontom, and transposition were infrequent anomalies.
3. No significant difference was found in the prevalence of different dental anomalies between males and females.

Recommendation

Further studies should be designed for larger sample sizes and different areas in Sudan together with clinical examination. Accordingly, the overall prevalence of dental anomalies among the Sudanese population can be established.

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