

A CLINICAL AND RADIOGRAPHIC SURVEY OF SELECTED DENTAL ANOMALIES AND CONDITIONS IN A SAUDI ARABIAN POPULATION

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تهدف هذه الدراسة إلى بيان مدى شيوع عشرة من الأشكال السنّية الشاذة بين (١٠١٠) من سكان جدة السعوديين وذلك باستخدام الفحص السريري والشعاعي .
لقد تبين أن الفقد الجزئي للأسنان كان الأكثر شيوعاً (٩١, ٩٪) يليه حالة التضخم الشاذ للأسنان (تورودونترزم) (٦١, ٨٪) .
صغر حجم الأسنان (٣٥, ٥٪) ثم وجود فراغ بين الأسنان (٤٦, ٤٪) في حين كان شيوع بعض الشذوذات الأخرى أقل شيوعاً مثل احتناء جذور الأسنان (١٩, ١٪) واختلاف وضع الأسنان (٢, ٠٪) بمقارنة نتائج هذه الدراسة بنتائج أخرى مماثلة تبين وجود فروق في مدى شيوع هذه الظواهر بين بلد وآخر .

The prevalence rates of 10 selected dental anomalies were determined clinically and radiographically among 1,010 dental patients of Saudi Arabian nationality residing in Jeddah, Saudi Arabia. Results showed that hypodontia was the most prevalent (9.41%) followed by taurodontism (8.61%); microdontia (5.35%); and diastema (4.46%). Other anomalies were found at lower frequencies ranging from 0.20% for transposition to 1.19% for dilaceration. Comparing these results with other studies showed that these anomalies occur at different frequencies among various countries and communities in the world.

Introduction

The form, size and colour of teeth as well as their eruption times in humans show wide, normal and biological variations within and among different populations of the world. Abnormal variations, however, do occur and in many cases, these are due to genetic, environmental and pathological factors. According to Sarnat and Schour,¹ the growing tooth is a biological recorder providing a precise and permanent record of variations and fluctuations in the tooth matrix and its mineralisation. These anomalies may be localised to one tooth or generalised to involve all the teeth or they may be part of systemic or syndromic disorders.²

Developmental anomalies of the dentition are not infrequently observed in the dental clinic. However, while these anomalies account for a relatively low number compared to the more common oral disorders such as dental caries and periodontal diseases, their clinical management is usually complicated as they present with malocclusion, esthetic problem, and possible disposition to other oral diseases.

Many epidemiological surveys have

been conducted in different parts of the world to determine the prevalence of various types of dental anomalies.^{3,4,5,6,7,8} These earlier results have shown that there are regional and ethn racial variations in the prevalence of dental anomalies. Since many of these studies were conducted without radiographic assessment, the prevalence of some abnormalities such as hypodontia and supernumeraries may have been underestimated in some of them.

This paper presents the results of a clinical and radiographic survey of anomalies of tooth number and morphology in a Saudi Arabian (Jeddah) population and compares them with results from other reports.

Materials and Methods

The subjects of this study were patients who attended the dental clinics of the Faculty of Dentistry, King Abdulaziz University, Jeddah, between 1995 and 1997. A total of 1,010 subjects, aged 12 - 40 years, comprising 532 (52.7%) males and 478 (47.3%) females Saudi citizens were included. Each patient was examined clinically and radiographically for dental anomalies. The clinical details included

Received 14 December 1997; Accepted 14 June 1998
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patient's age and gender. The numbers, sizes, and shapes of the dentition were carefully checked. All abnormalities were recorded. These clinical details were undertaken by the clinician on duty at the screening division of the outpatient clinic. A panoramic radiographic view of the jaws was taken for each patient. These radiographs were carefully analysed by one of the authors (N.S.) for any anomalies. To ensure reliability of clinical diagnosis, cases that could be secondarily confirmed by radiographic and/or study model evaluations were included in the study. The data were analyzed and subjected to chi-square statistical analysis where appropriate.

At the beginning of the study, fifty cases were randomly selected and assessed twice at one-week intervals. The results of the two examinations were subjected to Kappa statistical analysis for inter-examiner reliability assessment. A reliability figure of 0.98 was obtained.

The following anomalies were considered:

Hypodontia and Supernumeration

Established by clinically counting the teeth present and confirming by radiographs. **Microdontia and Macrodontia** - The sizes of the teeth were morphometrically determined by clinical, radiographic and study models. Only gross deviation in sizes easily discernible by clinical judgement were accepted. **Taurodontism** -Only the 1st and 2nd permanent molars teeth were assessed for this trait. This was done morphometrically according to the method of Seow and Lai 1989.⁹ Details of this procedures have been published earlier.¹⁰ Briefly, the crown-body (CB) and the root length (R) were measured along a vertical axis drawn perpendicular to the occlusal plane of the tooth. The CB:R ratios were then calculated to determine the presence or absence of the trait.

Diastema - Any persistent space between the central incisors after the eruption of the permanent canines.

Dilaceration - Determined radiographically using both the panoramic and lateral skull radiographs as any kink or bend on the crown or the root of the tooth.

Odontomas - These were radiographically and surgically confirmed as collections of hard dental tissue with no morphological similarities to any tooth type.

Transposition - Attributed when there was a change in the sequence of arrangement of different tooth types in the dentition.

Invagination - Diagnosed clinically and confirmed radiographically as an accentuated depression and/or pit in the singular areas of the incisors projecting inwards within the substance of the tooth.

Results

The prevalence of the ten selected dental anomalies are shown in Table 1. The prevalence of hypodontia was the highest at 9.41% followed by taurodontism at 8.61%, microdontia 5.35% and diastema at 4.46%. Dilaceration and supernumeration each accounted for 1.19%, while all the remaining abnormalities, ranging from 0.20% for tooth

Table 1. Prevalence of 10 selected dental anomalies in males (n=532) and females (n=578).

Anomaly	Males n (%)	Females n (%)	Total n (%)
Hypodontia	48 (9.02)	47 (9.83)	95(9.41)
Taurodontism	47 (8.83)	40 (8.36)	87(8.61)
Microdontia	29 (5.45)	25 (5.23)	54 (5.35)
Diastema	25 (4.70)	20(4.18)	45 (4.46)
Super numerary	9(1.69)	3 (0.63)	12(1.19)
Dilaceration	7(1.32)	5(1.05)	12(1.19)
Invagination	5 (0.94)	4 (0.84)	9 (0.89)
Odontoma	4 (0.75)	3 (0.63)	7 (0.69)
Macrodontia	4 (0.75)	1 (0.21)	5 (0.50)
Transposition	2 (0.38)	0 (0.00)	2 (0.20)

transposition to 0.89% for invagination, accounted for less than 1% of the subjects.

Tables 2 and 3 show the distribution of hypodontia according to sex and tooth type involved. There was a significant difference (P<.001) between the sexes. The 3rd permanent molars were the most commonly missing teeth (55.79%) followed by the lateral incisors (16.84%) and the 2nd premolars (14.74%). Both canines and central incisors were missing in 2 - 4% of the subjects. Among

all subjects with hypodontia (6.32%) exhibited anomalies showed that females were multiple missing teeth. When the third molars significantly more affected than the males were excluded from the analysis, the incidence (P<.05) (Table 2).

of missing teeth in the entire study group was 4.16%. Analysis of the second most prevalent dental anomaly in the study - taurodontism - without a significant difference in prevalence. Other dental anomalies were found at are shown in Tables 2 and 4. There was no significant difference in prevalence between the sexes (P<0.3). However, the difference between maxillary and mandibular molars was significantly different (p<.001).

The third most common anomaly in this study was microdontia. Analysis of data of this anomaly (Tables 2 and 5) showed that maxillary lateral incisors accounted for 53.70% of all cases with maxillary 3rd molars accounting for 46.30%. The figures for maxillary lateral incisors included not only microdontia cases but also the typical peg-shaped categories. There was no significant differences between the sexes (P.< 0.3) (Table 2).

Further analysis of the combined data of the above-mentioned three most common

Table 2. Prevalence of hypodontia, taurodontism, and microdontia according to gender of the subjects.

	Males (n= 532) %	Females (n=478)%	Total (n=1010)
Hypodontia	48 (50.53)	47 (49.47)	95(100)*
Taurodontia	48 (54.02)	40 (45.98)	87(100)**
Microdontia	29 (53.54)	25 (46.30)	54(100)***
Total	124(52.54)	112(47.46)	236(100)****

* $\chi^2 = 16$ df, 1 P < .001

** $\chi^2 = 5.76$, df 1, P < .1

*** $\chi^2 = 1.44$, df 1 P <.3

**** $\chi^2 = 7.26$, df 2, P <0.05

Table 3. Prevalence of hypodontia of different tooth types.

Tooth Type	Gender		Total
	Males	Females	
3rd Molars	26	27	53 (55.79)
Lateral Incisor	8	8	16(16.84)
2nd Premolars	8	6	14(14.74)
Multiple Teeth	3	3	6 (6.32)
Central Incisor	2	2	4(4.21)
Canines	0	2	2(2.10)
Total	47	48	95(9.41)

Table 4. A comparison of the prevalence of taurodontism between maxillary and mandibular permanent molars.

Tooth Type	Taurodontism		Total n(%)
	Present n (%)	Absent n (%)	
Maxillary Molars	49(14.08)	299(85.91)	348(100)
Mandibular Molars	7(2.01)	341 (98.00)	348(100)
Total	56 (8.05)	640(91.95)	696(100)

df = 1 $\chi^2=1764$ P< 0.001

Table 5. Prevalence of the microdontia in maxillary permanent lateral incisor and third molars.

	Maxillary Lateral Incisor	Maxillary 3rd Molars
Unilateral	19(65.52%)	23 (92.0%)
Bilateral	10(34.48%)	2 (8.0%)
Total	29	25

relatively low frequencies and therefore no further analysis was made to determine their sex differences or distribution patterns (Table 1).

Discussion

The data from the present study are on Saudi Arabian nationals who attended the outpatient department of the faculty of dentistry in Jeddah for treatment. Caution has been taken in extrapolating the results of the present survey to the larger population. However, data such as these can serve as a pointer to dental anomalies in the larger community and how they may affect the overall pattern of dental treatment provided in the community.

In this survey, the prevalence rates of the ten most commonly

were examined. While the prevalence of these abnormalities are quite low compared to other common oral and dental disorders such as dental caries and periodontal disease, they present a challenge to the practitioner as they may complicate the treatment of the common dental diseases like caries.

The authors deliberately chose a much higher age group compared to most of the other studies in the literature because of reports that teeth development could be extremely delayed in some cases.^{11,12} Although the size of the population with such extreme delays in eruption pattern is not known, data on anomalies such as hypodontia or supernumeraries collected in younger age groups may therefore be suspect, as they may either be under-reported as in the cases of supernumerary or over-reported as in cases of hypodontia.

Hypodontia - This accounted for the highest prevalence at 9.41% when the third molar was included. Without the 3rd molar the incidence figure was 4.16%. These figures were generally higher than those from other population groups. Clayton 1956³ reported a prevalence of 6.01% among 3-12 year old children in Kansas, USA; Thompson 1974¹³ gave a figure of 7.4% among 6-12 year old children in Toronto, Canada; Warnakulasuriya 1989⁶ reported a figure of 3.20% in Srilankan 13-16 year old while Sawyer et al 1989⁵ and Adeniji 1993³ gave prevalence figures of 0.70 and 0.40 among school children in Lagos, Nigeria. The only known published investigation from Saudi Arabia by Salem 1989⁷ reported a prevalence figure of 2.2% among 4-12 year old in Gizan area. The higher prevalence figures in the present study may be due to racial differences and the fact that a much higher age group was included.

There was a gender predilection in this study for this anomaly ($P < 0.001$) (Table 2), with the higher prevalence in the females. The most commonly missing teeth in descending order of frequency were the lateral incisors, the third molars and the 2nd premolars (Table 3).

Taurodontism - This was the second most common anomaly in the group with a prevalence figure of 8.61%. There was no gender predilection, but more cases were found in the maxillary molars compared to the mandibular molars ($P < 0.001$) as seen in Table 5. The reason for this difference may be the morphological difference of the teeth. The

maxillary molars are three-rooted while the mandibular molars are two-rooted. The current opinion on the aetiology of this anomaly is that it results from a failure of the infolding of epithelial rootsheath of Hertwig - the structure involved in root development and growth. Goldstein and Gotlieb⁴ suggested that lack of bridge formation in this root-forming structures of furcated teeth prior to dentin deposition would result in a large pulp chamber. The rationale therefore is that in the maxillary molars, with three roots, the effect of this trait, when present, would be more marked than in the mandibular molars. The authors' findings fall within the reported prevalence rate of 0.09 - 40% in different communities of the world.^{15,16,17}

Many studies have also suggested association between taurodontism and hypodontia.^{9,8} In the present study only 7.7% of the cases with taurodontism presented with hypodontia, a very low association.

Microdontia and Peg-shaped Laterals - The third most common dental anomaly was microdontia with a prevalence figure of 5.35%. The maxillary lateral incisors and the maxillary 3rd molars accounted for a little over half of these anomalies. (Table 5).

Our figure of 1.0% for peg-shaped lateral incisors is higher than the figure of 0.37% reported by Salem 1989⁷ in Gizan, Saudi Arabia and 0.33% reported by Clayton 1956³ in USA but lower than the Nigerian figures of 1.70% and 1.50% reported by Adeniji 1993⁸ and Sawyer et al 1984,⁵ respectively. There was also no gender predilection for this anomaly in this group (Table 2).

Diastema - A midline diastema usually is a part of normal dental development during the mixed dentition stage. In most cases, with the eruption of the maxillary canines, these diastema tend to close spontaneously. Persistence of a diastema therefore could be due to genetic predisposition or other pathological factors, such as, enlarged labial frenum, oral habits, muscular imbalance, and abnormal maxillary arch form.

In this study, the prevalence of a diastema was 4.46% and there was no significant difference between the sexes. All cases were found in the maxillary anterior region with only 2 patients having concomitant diastema between the lower incisors. This figure is relatively low compared to reports from other communities in the world. In a

study of 7000 US patients by Brunelle et al 1996,¹⁹ diastema was reported as 19% in 8-11 year old, 6% in the 12-17 year old and 5% in 18-50 year old groups. A much higher figure was reported by Hassanali and Pokhairya (1993)²⁰ among different ethnic populations in Kenyan African, whose overall figure of 49% reflected variations in the ethnic population groups of the country. They also reported a higher prevalence in females compared to males. Genetics may be the basis for these different observations.

Midline diastema is viewed either as esthetically pleasing or as an abnormality in different communities of the world. History of dentistry also revealed communities where diastema were created where none existed before to enhance the beauty of the individuals. However, in some communities especially the Caucasian communities, diastema is viewed as a form of abnormality. A recent study by Kerosuo et al 1995²¹ on the social attractiveness of young adults in Finland reported that faces with incisal crowding and midline diastema were ranked as significantly less intelligent, less beautiful, less attractive and adjudged to belong to lower social class than faces with ideal occlusion.

Other anomalies - The prevalence of other anomalies ranged from 0.2% for tooth transposition to 1.19% for supernumeraries and dilaceration of teeth. The authors' figure for supernumeraries is higher than the figure of 0.5% reported by Salem⁷ in Gizan, Saudi Arabia and Adeniji⁸ in Nigerian School Children but lower than 2.24% reported by Clayton³ in US. All the cases with supernumeraries were observed in incisors, premolars and the 3rd molar regions - the same three sites common for hypodontia.

Crown dilaceration of a permanent tooth constitutes 3% of traumatic injuries to developing tooth²² and usually involves the maxillary incisors and less frequently the mandibular incisors.²³ The dilaceration cases in this study involved the maxillary permanent central incisors and history of trauma was obtained in all cases.

Odontoma was noted in 0.69% of the subjects and was seen in maxillary anterior and the 3rd molar regions. In all cases, they prevented the eruption of a tooth and had to be surgically removed.

Macrodonia was observed in 5 cases (0.50%) in the anterior teeth only as

determined by gross impression.

Transposition was observed in only 2 cases, both cases, involving the canines and the first premolars. One case involved the maxilla while the second was in the mandible and both cases were seen in the males. The 2 cases represent an incidence figure of 0.2% which is lower than the prevalence figure of 0.4% reported by Chattopadhyay and Srinivas 1996.²⁴

Conclusion

Data from this study and their comparison to other studies showed that different dental anomalies occur with different frequencies in many countries of the world and even within the same country among different ethnic or regional groups. As with other developmental traits in humans, these anomalies are under genetic and environmental control, hence, the regional differences.

While the overall prevalence of each of these anomalies in the dental clinic or population group may be low, their presence may, in some cases create a management problem or complicate treatment options for patients. Therefore, their diagnosis and management are of importance for general patient management.

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