Dental Research Journal

Original Article

Consanguinity-related hyperdontia: An orthopantomographic study

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ABSTRACT

Background: The aim of this retrospective study was to describe the distribution of the non-syndromal supernumerary teeth (NSST) in a population of patients who attended the clinics of Riyadh Colleges of Dentistry and Pharmacy (RCsDP), Riyadh, Saudi Arabia.

Materials and Methods: The study reviewed 1521 panoramic radiographs of Saudi and non-Saudi subjects who attended RCsDP clinic from November 2009 to November 2010. The data were analyzed using the Statistical Package for Social Sciences, utilizing Chi-square.

Results: Eighteen (1.2%) patients were found to have NSST, comprising twelve males (66.7%), and six females (33.3%). The most common supernumerary teeth (ST) were the pre-molars six cases (33.3%), followed by the mesiodens, five cases (27.8%). The canines and distomolars three cases (16.6%) each respectively, while the least were the lateral incisors and paramolars of the two cases (11.1%) each.

Conclusion: Consanguinity appeared to have a role in the development of hyperdontia in Saudi population because 13 cases (72.2%) out of 18 cases had consanguineous parents, while all patients having consanguineous parents had eumorphic ST.

Key Words: Consanguinity, eumorphism, hyperdontia, non-syndromal supernumerary teeth, non-Saudi population, Saudi population

Received: June 2012
Accepted: March 2013

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INTRODUCTION

Supernumerary teeth (ST), or hyperdontia, are the teeth that exceed the normal dental formula, independent of their location and form.[1] Non-syndromal supernumerary teeth (NSST) could lead to crowding, delayed eruption, development of a diastema, cystic lesions such as dentigerous cysts and resorption or rotation of the adjacent teeth, therefore early diagnosis, proper evaluation and appropriate treatment are essential.[2]

Supernumerary teeth may occur as single or multiple, may be unilateral or bilateral either in maxilla or mandible, or both, and maybe classified chronologically, morphologically, and topographically.[3] The supernumeraries affect both dentitions, though they are less common in the primary dentition, with no distinction between sexes. In the permanent dentition males are twice as affected as females.[4-6]

Etiology of NSST is controversial. Several hypotheses were considered, including avatism and dichotomy in which a dental germ suffers mitosis, generating similar teeth. Borsato, *et al*.[7] associated excess of teeth to genetic factors. Furthermore, traumas may occur mainly in the period of development of the dental follicle, leading it to divide, and favoring the development of NSST.[8] Sometimes it is part of the systemic or syndromic disorders,[9,10] such as Gardner's syndrome, down's syndrome and cleidocranial dysplasia.[11]

Consanguinity is a known factor in the etiology of many diseases.[12] Arab countries have some of the highest rates of consanguineous marriages in the world, and specifically, first cousin marriages, which

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may reach (25-30%) of all marriages.[13] A large Lebanese consanguineous family has been reported to have four individuals who exhibited five incisors in the anterior mandible.[14]

The prevalence of hyperdontia varies significantly among ethnic groups and different ages.[15] Table 1 shows the prevalence rates of the hyperdontia in different countries with the various ethnic and religious background.

The objective of the present study was to investigate the prevalence and characteristics of NSST and evaluate its association with the parents' consanguinity among patients attending Riyadh Colleges of Dentistry and Pharmacy (RCsDP).

MATERIALS AND METHODS

Records and radiographs of 1521 patient who attended the out-patient clinic of RCsDP, Riyadh, Saudi Arabia, between November 2009 and November 2010, were retrospectively examined for the presence of supernumerary (erupted or impacted) teeth. For each detected case the following was recorded, age, sex, nationality, teeth condition, location, consanguinity, and others. All radiographs were imaged using the digital panoramic machine "Sirona 2005" ORTHOPHOS XG, where the active sensor area was 138 mm × 6.48 mm and 0.027 mm pixel size resolution. The radiographic monitor resolution was 1024 × 768 pixels, Germany. Data collected were entered into a spreadsheet (Excel 2000; Microsoft Office, Microsoft Corporation, USA) and analyzed subsequently using the Statistical Package for Social Sciences (Windows version 9.0; SPSS Inc., Chicago, IL, USA), utilizing Chi-square.

RESULTS

Eighteen of the 1521 cases (1.2%) had ST. Twelve of these (66.7%) were males and 6 (33.3%) were females. The frequency differences were not statistically significant.

The pre-molars ST appeared more frequently, six cases, (33.3%), followed by the mesiodens, five cases, (27.8.%), the canine three cases, (16.7%) while the supernumerary laterals and distomolars were the least encountered supernumerary two in each type (11.11%) (Figure 1). The maxillary arch registered ten cases, (55.6%) while, the mandibular arch had eight cases, (44.4%), occurring singly in each case 16 (88.9%) (Table 2).

With regard to morphology of supernumeraries, twelve supernumeraries were eumorphic (66.7%), two cases, (11.1%) were heteromorphic, conical four cases (22.2%) and tuberculate four cases (22.2%). Differences were not significant. While, the vertical position was the most common 13 cases (72.2%).

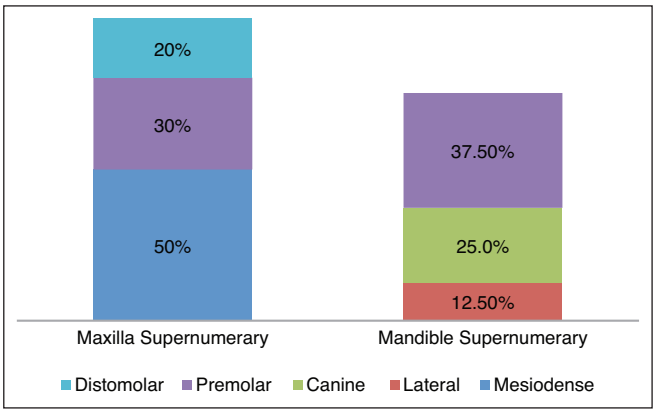

Figure 1: Distribution of supernumerary teeth in the maxilla and mandible according to type

Table 1: Summary of hyperdontia prevalence studies

Country	City	Author	Population	Age category	Prevalence %
Brazil	Rio de Janeiro	Küchler, *et al.*, 2011[16]	1166	6-12 years	2.3
Saudi Arabia	Gizan	Salem, 1989[17]	2393	4-12 years	0.5
	Tabuk	Osuji, *et al.*, 2002[18]	1878		1.1
Mexican	Mexico city	Salcido-García, *et al.*, 2004[19]	2245	2-55 years	3.2
Turkey	Isparta	Esenlik, *et al.*, 2009[20]	2599	Mean age 8.6 years	2.7
	Erzurum	Celikoglu, *et al.*, 2010[21]	3491	12-25 years	1.2
Switzerland	Zurick	Schmuckli *et al.*, 2010[22]	3004	6-15 years	1.5
Spain	Madrid	Varela *et al.*, 2009[23]	2108	7-16 years	2.0
India	Greater Noida	Puja, *et al.*, 2010[24]	1000	18-50years	1.9
Iran	Shiraz	Ghabanchi, *et al.*, 2010[10]	414	15-60 years	2.4
Greek	Thessaloniki	Fardi, 2011[25]	1.239	18-48 years	1.8

Table 2: Distribution and prevalence of supernumeraries in the maxilla and mandible with reference of tooth type and being erupted or impacted

Location	Tooth type										Total	Percentage
	Mesiodens		Lateral		Canine		Premolar		Distomolar			
	Impact	Erupt	Impact	Erupt	Impact	Erupt	Impact	Erupt	Impact	Erupt		
Maxilla	5	0	0	0	0	0	3	0	2	0	10	55.6
Mandible	0	0	1	1	3	0	2	1	0	0	8	44.4
Total	5		2		3		6		2		18	100
Percentage	27.8		11.1		16.7		33.3		11.1		—	100

Nationalities of the cases were Saudi twelve cases (66.6%) and non-Saudi six cases (33.3%). Further details are shown in Table 3.

A significant finding was the percentage of subjects with consanguineous parents and ST which comprised (72.2%) that is 13 subjects out of 18. The distribution of subjects nationalities were nine Saudi subjects, that is 50% of all population, while only four (22%) were non-Saudi including (one Egyptian, one Syrian, one Yemini and one Pakistani). On the other hand, those with non-consanguineous parents were only five subjects (27.8%) including, (three Saudi, one Egyptian and one Filipino) (Figure 2).

DISCUSSION

The data from the present study and their comparison with other studies[10,16-25] shows that NSST occur with the 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 human beings, these anomalies are under genetic and environmental control, leading to regional differences.

The most useful radiographic examination for ST is the rotational tomography or Orthopantomograph.[26] It has been reported that their prevalence ranges between 0.1-3.8% in the permanent dentition.[26,27] However, to determine the actual prevalence of ST, a representative and randomized sample of the general population is required, and thus, the most common practical approach is to examine radiographs from the specific populations, which will inevitably involve the risk of bias in the data analysis. Taking into account the source of the analyzed data, which were derived from the Diagnostic Sciences Department of RCsDP, the large age range of the examined sample and the limited exclusion criteria, one might consider that the results of this study were not representative of the general population. However, the primary aim of this study was to investigate the frequency of NSST in patients who attend our college, which was found to constitute 1.2% of the studied population.

When comparing our results with other studies, (Table 1) we found that the Brazilian, the Indian, the Greek, Mexico, Isparta and Erzurum/Turkey, Switzerland, Spain, and Iran and even in Tabuk and Gizan two Saudi's cities with nearly similar number of studied patients' sample radiographic records had reported (2.3%, 1.9%, 1.8%, 1.1%, 3.2%, 2.7%, 1.2%, 1.5%, 2% 0.5%, and 2.4% respectively),[16-20,22-26] showing higher prevalence percentage than our study except for Tabuk area, which had nearly similar result while less prevalence in Erzurum/Turkey, Switzerland, and Gizan city.

In this study, most cases were males within a ratio 2:1 than females. This finding is in accordance with other studies who found that males are affected approximately twice as frequently as females in the permanent dentition.[7] However, according to Gomes *et al*.,[28] the sex ratio is in favor of males in non-sequential ST (all ST diagnosed in an individual moment without further development of new teeth), while, this ratio does not seem to exist in sequential ST (ST developing in a sequential manner, in different moments of a determined period of the patient's life) with girls and boys being almost equally affected.

A little more than half of the cases (55.5%) are in the maxilla with mesiodense accounting for (50%), whereas in the mandible supernumerary pre-molars predominated at (37.5%) (Figure 1). This finding is in accordance with other studies who found a higher percentage of ST occurrence in the maxilla than the mandible.[27,29]

This study revealed only four cases (22.2%) required surgical intervention due to crowding. Fernández-Montenegro, *et al*., advised that in cases, where the supernumerary tooth does not cause any symptoms

Table 3: Distribution of supernumerary teeth by nationality, gender and shape in relation to consanguinity

Consanguinity	Saudi		Non-Saudi		Tooth shape		Percentage
	Male	Female	Male	Female	Eumorphic	Heteromorphic	
Consanguineous	8	1	2	2	12	0	72.2
Non-consanguineous	1	2	1	1	1	5	27.8
Total	9	3	3	3	13	5	—
Percentage	66.6		33.3		66.7	33.2	100

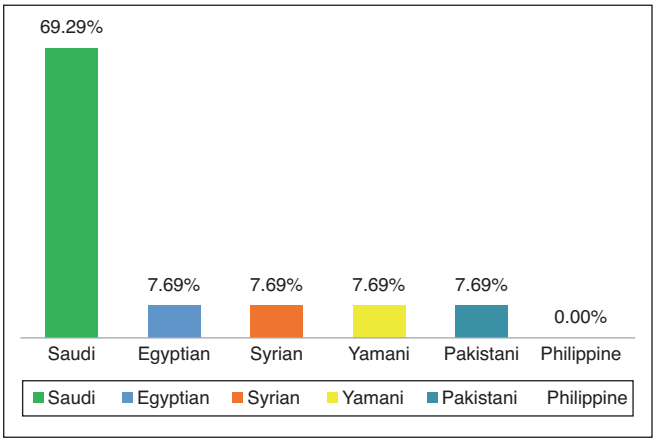

Figure 2: Percentage of consanguinity between Saudi and non-Saudi Nationalities in Riyadh Colleges of Dentistry and Pharmacy patients with supernumerary teeth

or when there is an elevated risk of damaging the development of the permanent tooth it is advisable to avoid therapeutic approach and instead adhere to periodic clinical and radiological examinations.[30]

Fourteen of our cases were scheduled for follow-up only because they were asymptomatic. It has been found that approximately 25% of permanent ST were erupted, and the remainder are unerupted.[31] In contrast, Tay, *et al.*[11] recorded a lower rate, of approximately 15%, of permanent supernumeraries were erupted and Liu *et al.*[29] reported a higher rate, of 34%. In the present study, 33.3% were erupted while the remainders were uneruprted.

Most of our cases were Saudi and it was not possible to statistically relate this to any nationality factor.

In this study, 13 (72.2%) patients had consanguineous parents. They were distributed as follows (nine Saudi patients (69.29%), one Egyptian (7.69%), one Syrian (7.69%), one Yemini (7.69%) and one Pakistani (7.69%) while the remaining five subjects were (three Saudi and two non-Saudi including one Egyptian and one Filipino). Cassia, *et al.*,[14] reported a large consanguineous Lebanese family with four individuals displaying five incisors in the anterior mandible, in addition to environmental factors, consanguinity can be one of the causes of ST development.

Arab countries have some of the highest rates of consanguineous marriages in the world, and specifically first cousin marriages, which may reach (25-30%) of all marriages.[30] Moreover, according to Tadmouri, *et al.*,[13] the Arab populations have a long tradition of consanguinity due to socio-cultural factors. Regarding Saudi Arabia, El-Hazmi, *et al.*,[31] found that the overall rate of consanguinity reached (57.7%). These results place Saudi Arabia among the countries of the world with a high rate of the consanguinity.

In this study, consanguineous marriages were 13 cases (72.2%) between Saudi patients because they constitute the highest number of subjects attending RCsDP, and from which the present study was extracted.

In this study, eumorphic variety was (66.6%), which was different from data from the studies that reported preponderant heteromorphic variety of ST.[21,27,30,] Eleven of our twelve eumorphic cases were in the consanguineous marriage.

From the genetic point of view, there is evidence from animal studies that genetic factors do play a role in ST formation.[32] However, the interplay of these factors and the targets of their pathways remain largely unknown. These types of studies guide the selection of candidate genes for evaluation in human as the prevailing mechanisms hypothesized to cause ST include hyperactivity of the dental lamina, resulting in the formation of additional, or dichotomy of the dental tooth germs that result in more than one tooth.[32]

CONCLUSION

In this study, the prevalence of ST was low, but significant because the majority of the cases were in the consanguineous marriages. A true correlation between consanguinity and development of eumorphic supernumeraries in off springs was clearly apparent.

Collaboration between dental professionals and human geneticists is crucial to try to further disclose underlying genetic causes by complete family history and to create a pedigree highlighting affected and unaffected members.

Important actions from governmental and private sectors should be taken on educating families regarding the impact of consanguineous marriage in Saudi Arabia, and how this contributes to health problems. Teeth supernumeraries are a good example as suggested by this study.

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How to cite this article: Shokry SM, Alenazy MS. Consanguinity-related hyperdontia: An orthopantomographic study. Dent Res J 2013;10:732-6.
Source of Support: Nil. **Conflict of Interest:** None declared.