

Radiographic Study of Developmental Alteration in Tooth Number among Children in IIUM Dental Clinic

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Abstract

Background: The aim of this research was to determine the prevalence, distribution and association of developmental alteration in tooth number with gender, location, and presence of delayed eruption of tooth among children who attended to Student's polyclinic of IIUM Kuantan, Malaysia. **Methods:** A cross sectional study on total 727 Orthopantomograms (OPGs) of 3-17 years old children from April 2009 to July 2012. OPGs with presence of alteration number were scrutinized to find out the prevalence, distribution and association. The data was analyzed comparing gender, location and presence of delayed eruption and tested using Chi-square test. **Results:** Out of 727 OPGs, 71 OPGs showed developmental alteration in tooth number. The prevalence was 98/1000 OPGs within 3 years. Among those 71 OPGs, the gender differences were: males (49.3%) and females (50.7%). Locations were found in maxilla (45.1%), mandible (40.8%) and both (14.0%). The finding of delayed eruption was (7.0%). There were significant differences between alteration in tooth number with location as ($p < 0.05$) while there were no significant differences with gender and delayed eruption as ($p > 0.05$). **Conclusions:** This study showed that hyperdontia was considerably lower than hypodontia. There was association between alteration in tooth number with location, but no association with gender and delayed eruption.

Keywords: delayed eruption, hyperdontia, hypodontia, orthopantomogram

Introduction

Alteration in tooth number involves hyperdontia (supernumerary teeth) and hypodontia.¹ The etiology is not fully understood. Both genetic and environmental factors have been considered. The alteration results from problems during the initiation of dental development such as physical disruption of dental lamina and failure of dental lamina induction by ectomesenchyme.² Hypodontia and hyperdontia teeth are terms describing excess of tooth number that can occur in both primary and permanent dentitions.³ There are certain problems associated with alteration in tooth number.

Hyperdontia are classified according to morphology or location.⁴ Classification based on morphology are conical, tuberculate, supplemental, and odontomes. Classifications based on location are mesiodens, paramolar, distomolar, and parapremolar.⁴ The problems associated with hyperdontia are failure of tooth eruption, spacing and cystic formation.⁵ Erupted supplemental teeth most often cause crowding. The problem is usually noticed with the eruption of the maxillary lateral incisors together with the failure of eruption of one or both central incisors.⁵ A supplemental lateral incisor may increase the crowding

potential and may cause an aesthetic problem in the upper anterior region. Hyperdontia in other locations may also prevent or delay the eruption of adjacent teeth. According to the study in children population of Caucasian, East Asia, Britain and Malaysia found that the prevalence of hyperdontia was higher than hypodontia.⁶⁻⁸

Hypodontia is characterized by congenital missing of one or more teeth.⁹ Genetics probably represents the primary etiological factor of hypodontia.² However, major environmental factors that have been reported include infection, such as rubella; drugs, such as thalidomide, and irradiation. The prevalence of hypodontia is higher in families of affected patients. Recently, a mutation in gene MSX1 of the chromosome 4 was identified in a large family who's all members showed hypodontia of second premolars and third molars.¹⁰ Problems associated with hypodontia were diminutive contralateral incisor, transposition, ectopic eruption, delayed eruption, prolong retention of primary teeth.²

Developmental dental anomalies are frequently observed during routine dental examinations. Early identification of a treatable anomaly plays a significant role in planning comprehensive management of the child. Function,

aesthetic and occlusal disharmony may be recognized sufficiently. Inter professional consultation and treatments in specific cases are needed. Thus, it has become a great concern among dental community which brings out the interest of researchers to study about this subject in detail.

The objective of this study was to determine the presence, distribution and association of alteration in tooth number among pediatric patients attending Student's Polyclinic of Kulliyah of Dentistry (KOD). These findings could contribute to early diagnosis and long term treatment planning with the aim of diminishing functional and aesthetic disorder resulting from dental anomalies. This paper can support clinician in clinical practice, contributing to contemporary understanding of dental anomalies specifically in alteration in tooth number, their distributions and association.

Methods

A cross sectional descriptive and analytical studies were used. The material for the research included Orthopantomograms (OPGs) record of 727 patients who had undergone treatment in Student's Polyclinic, Kulliyah of Dentistry, International Islamic University Malaysia. The sample population was all children aged between 3-17 years old who attended to Student's Polyclinic and took OPGs within 2009-2012. The data was collected from children aged 3 years old because the availability of resources in Student's Polyclinic starting from this age. Patients who were 18 years old and above, patients with defect such as cleft lip or cleft palate, patients with syndrome such as Down syndrome, Gardner's syndrome and ectodermal dysplasia, and errors of artifacts in the OPGs were excluded from this study. Patients who were 18 years old and above were excluded based on the definition of child by the Convention on the Rights of the Child (CRC) and Malaysia's Child Act 2001.

Total 727 OPGs of 3-17 years old children who attended to students' polyclinic were scrutinized to find out the

prevalence, distribution, and association. Then all the OPGs were divided into two groups either normal radiograph without the presence of developmental alteration in tooth number or radiograph with presence of developmental alteration in tooth number by counting permanent tooth bud and erupted permanent teeth. Frequency tables were used for description of variables under study and to compare gender, location and delayed eruption categories the chi-square test was used. All data were analyzed by SPSS version 20.

Results

A total of 727 OPGs were analyzed, 348 males (47.9%) and 379 females (52.1%). Out of 727 OPGs, 71 OPGs showed developmental alteration in tooth number while 656 OPGs showed no developmental alteration in tooth number. The prevalence of developmental alteration in tooth number was 9.8% within 3 years. Among this alteration, the prevalence of hyperdontia was 1.8%, hypodontia 7.8%, and both 0.1%.

The distribution of developmental alteration in tooth number ($n = 71$) by gender was 35 males (49.3%) and 36 females (50.7%) (Table 1). The majority of developmental alteration in tooth number ($n = 71$) were in the maxilla (45.1%). 40.8% found in the mandible and 14.1% found in both maxilla and mandible (Table 2). There were only 5 (7.0%) out of 71 delayed eruption in-patient with developmental alteration in tooth number. These includes OPGs with Hyperdontia, Hypodontia, and both ($n = 71$) showed the presence of delayed eruption of tooth.

The association between developmental alteration in tooth number ($n = 71$) with gender, location, and presence of delayed eruption of tooth were analyzed. There was significant difference between developmental alterations in tooth number with the location as ($p < 0.05$) while there were no significant differences between developmental alteration in tooth number with gender and delayed eruption as ($p > 0.05$).

Table 1. Distribution of Developmental Alteration in Tooth Number of Gender

| Developmental alteration in tooth number | Hyperdontia Number (%) | Hypodontia Number (%) | Both Number (%) | Total Number (%) |
|--|------------------------|-----------------------|-----------------|------------------|
| Male | 9 (12.7) | 25 (35.2) | 1 (1.4) | 35 (49.3%) |
| Female | 4 (5.6) | 32 (45.1) | 0 (0.0) | 36 (50.7%) |

Table 2. The Distribution of Developmental Alteration in Tooth Number in Location

| Developmental alteration in tooth number | Hyperdontia Number (%) | Hypodontia Number (%) | Both Number (%) | Total Number (%) |
|--|------------------------|-----------------------|-----------------|------------------|
| Maxillary | 10 (14.1%) | 22 (31.0%) | 0 (0.0%) | 32 (45.1%) |
| Mandibular | 3 (4.2%) | 26 (36.6%) | 0 (0.0%) | 29 (40.8%) |
| Both | 0 (0.0%) | 9 (12.7%) | 1 (1.4%) | 10 (14.1%) |

Discussion

Panoramic radiograph has many advantages such as broad coverage of teeth. Low patient radiation dose and low cost compares to full mouth of periapical radiograph.¹¹ It is also an indispensable tool for early detection of dental anomalies.¹¹ The decision to take panoramic radiograph was based on treatment needed. In this study, investigation the prevalence, distribution and association of developmental alteration in tooth number due to some findings of hyperdontia and hypodontia in radiographic storage of pediatric patient attended to student's polyclinic of International Islamic University Malaysia (IIUM). Some investigators also used panoramic radiographs to determine the prevalence of dental anomalies such as Ezoddini *et al.* in University of Medical Sciences Yazd, Iran,¹² Gupta SK *et al.* in Governmental Dental College, Indore Madhya Pradesh, India and Bruce C *et al.* in Black pediatric patients.⁷

According to Gabris *et al.* (2006), various studies have reported the prevalence of hyperdontia to be between 1 and 3% while the prevalence of hypodontia between 14.69%.¹³ The finding was in line with this result that prevalence of hypodontia (7.8%) was higher than hyperdontia (1.8%). However, wide variations in this prevalence have been reported. Nik Hussein reported prevalence of hypodontia in Malaysian children which were much lower than this study (2.8%).¹⁴ The difference could be as a result of the sample size and age range included in the previous study. There was a recent study that had been done in the Caucasian population. It reported that hypodontia prevalence had been increased over the year.⁷ This phenomenon occurs may be due to a reduction in the width of the alveolar process and more advance screening and diagnose of dental anomalies.

For gender differences, the prevalence rates for hypodontia were higher in females compared to males. These findings were supported by other studies that give a similar result by Collin J, Endo T *et al.*, Rolling, and Bergstrom.⁹ While prevalence rates for hyperdontia was higher in males compared to female. This result had been supported by many authors: L.D. Rajab & M.A.M Hamdan have reported a sex ratio of 2.2:1,⁸ Gomes *et al* recorded 1.3:1,⁶ and Zilberman *et al* reported 2.5:1⁸ in favor for male. However, this study stated that there were no gender differences in the presence or percentage of developmental alteration in tooth number.

In this study, significant relationships between alterations in tooth number in location have been recorded while there were no significant relationships with delayed eruption and gender. Unfortunately, sufficient

information for this association is not available in the literature. Further research on this hypothesis is required.

Conclusions

The hyperdontia prevalence of 1.8% found in this study was considerably lower, while hypodontia prevalence of 7.8% was higher compared to the previous study that was done in Malaysia. Developmental alteration in tooth number was found considerably more frequently in the maxilla than in the mandible. There was an association between alteration in tooth number in location and no association between alteration in tooth number of gender and delayed eruption of teeth.

Developmental alteration in tooth number is relatively common and there are many problems or complications that associated with it. Early identification of developmental alteration in tooth number is useful to avoid the complications to the developing dentition and to assure the successful management.

Conflicts of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

References

1. Davis PJ. Hypodontia and hyperdontia of permanent teeth in Hong Kong schoolchildren. *Comm Dent Oral Epidemiol.* 1987;15:218-20.
2. Rakhshan V. Congenitally missing teeth (hypodontia): A review of the literature concerning the etiology, prevalence, risk factors, patterns and treatment. *Dent Res J.* 2015;12:1-13.
3. Shah A, Gill DS, Tredwin C, Naini FB. Diagnosis and Management of Supernumerary Teeth. *Dent Update.* 2008;35:510-20.
4. Garvey MT, Barry HJ, Blake M. Supernumerary teeth and overview of classification, diagnosis, dan management. *J Can Dent Assoc.* 1999;65:612-6.
5. Proff P, Fanghänel J, Allegrini S Jr., Bayerlein T, Gedrange T. Problems of supernumerary teeth, hyperdontia or dentes supernumerarii. *Annals of Anatomy-Anatomischer Anzeiger.* 2006;188:163-9.
6. De Oliveira Gomes C, Drummond SN, Jham BC, Abdo EN, Mesquita RA. A survey of 460 supernumerary teeth in Brazilian children and adolescents. *Int J Paediatr Dent.* 2008;18:98-106.
7. Bruce C, Manning-Cox G, Stanback-Fryer C, Banks K, Gilliam M. A radiographic survey of dental anomalies in Black pediatric patients. *NDA J.* 1994;45:6-13.
8. Rajab LD, Hamdan MAM. Supernumerary teeth: review of the literature and a survey of 152 cases. *Int J Paediatr Dent.* 2002;12:244-54.
9. Larmour CJ, Mossey PA, Thind BS, Forgie AH. Hypodontia--a retrospective review of prevalence and etiology. Part I. *Quintessence Int.* 2005;36:263-8.

10. Mostowska A, Biedziak B, Jagodzinski PP. Novel MSX1 mutation in a family with autosomal-dominant hypodontia of second premolars and third molars. *Arch Oral Biol.* 2012;57:790-5.
11. Lam EWN. Considerations for the Use of Ionizing Radiation in Dentistry. *PEAK.* 2011:1-12.
12. Ezoddini AF, Sheikhha MH, Ahmadi H. Prevalence of dental developmental anomalies: a radiographic study. *Comm Dent Health.* 2007;24:1-5.
13. Gabris K, Fabian G, Kaán M, Rózsa N. Prevalence of hypodontia and hyperdontia in paedodontic and orthodontic patients in Budapest. *Comm Dent Health.* 2006;23:80-2.
14. Nik-Hussein NN, Abdul Majid Z. Dental anomalies in the primary dentition: distribution and correlation with the permanent dentition. *J Clin Pediatr Dent.* 1996;21:15-9.