

Delayed tooth eruption and its pathogenesis in paediatric patient: a review

Abstract

Human eruption is a unique developmental process in the organism. Delayed tooth eruption is the emergence of a tooth into the oral cavity at a time that deviates significantly from norms established for different races, ethnicities, and sexes. The eruption time of primary teeth is very important for planning and diagnosing of certain growth developments. The present article gave a review on delayed tooth eruption and its pathogenesis.

Keywords: delayed tooth eruption, oral cavity, eruption

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Introduction

Tooth eruption is the process by which developing teeth emerge through the soft tissues of the jaws and the overlying mucosa to enter the oral cavity, contact the teeth of opposing arch, and function in mastication.¹ The term “eruption” is derived from the Latin word “eruptio,” which means output with momentum.² It is a continuous process that ends only with the loss of tooth. Eruption of deciduous teeth, their exfoliation followed by eruption of permanent dentition is an orderly, sequential, and age-specific event and is considered as an important milestone during child’s development.³ Parents consider eruption of first primary teeth as an important developmental milestone that has to be achieved by the child.^{4,5} Eruption is a physiologic process that strongly influences the normal development of the craniofacial complex.^{6,7}

Pathogenesis and aetiology: The process of normal eruption and the source of eruptive forces are still controversial topics. Some local and systemic factors may affect the pattern of eruption. Others factors affect the timing of eruption.

Local conditions causing delayed eruption include:

Physical obstruction: These obstructions can result from many different of causes, such as supernumerary teeth, mucosal barrier, scar tissue, and tumors. It has been reported to occur in 28% to 60% of white people with supernumerary teeth.⁸

Mucosal barrier has also been suggested as an etiologic factor in delayed teeth eruption⁹⁻¹²

Gingival hyperplasia due to hormonal imbalance, hereditary causes, vitamin C deficiency or phenytoin drugs cause increase of dense connective tissue and the acellular collagen that can affect the normal tooth eruption.¹³

Traumatic injuries can lead to ectopic eruption^{35,36} or some disruption in normal odontogenesis in the form of dilacerations^{14,15} or physical displacement of the permanent germ.^{16,17}

Cystic transformation of a nonvital deciduous incisor might also cause delay in the eruption of the permanent successor.¹⁸

Ankylosis, the fusion of the cementum or dentin to the alveolar bone, is the most common local cause of delayed deciduous tooth exfoliation.¹⁹⁻²⁴

Arch-length deficiency is often mentioned as an etiologic factor for crowding impactions.^{19,20}

Systemic conditions include:

The effect of **nutritional deficiency** on tooth eruption have been reported.²⁴⁻²⁶

Disturbance of the endocrine glands usually has a profound effect on the entire body, including the dentition. The dentofacial changes in cretinism are related to the degree of thyroid deficiency.⁷⁻²⁹ In pituitary dwarfism, eruption and shedding of teeth are delayed, as is the growth of the body in general.^{27,30,31} Retardation of dental growth and development in **preterm babies** has been reviewed by Seow and identified as a cause of delayed Tooth Eruption.³² Patients with human immunodeficiency virus (**HIV**) infection showed delayed tooth eruption. A study of dental manifestations in 70 children perinatally infected with HIV reported that delayed dental eruption.³³ In a study of children with **cerebral palsy**, Pope and Curzon found that unerupted deciduous and permanent teeth were more common in them compared with the controls. The first permanent molar erupted significantly later. No etiology or implicated mechanisms were elaborated.³⁴ Other systemic conditions associated with impairment of growth, such as **anemia** (hypoxic hypoxia,³⁵ histotoxic hypoxia, and anemic hypoxia³⁵) and **renal failure**,³⁶ have also been correlated with delayed Tooth Eruption and other abnormalities in dentofacial development.

Genetic disorders: A generalized developmental delay in permanent tooth formation is seen in Apert syndrome.^{37,38} Supernumerary teeth have been found to be responsible for delayed Tooth Eruption in Apert syndrome,^{37,39} cleidocranial dysostosis,⁴⁰ and Gardner syndrome.⁴¹

Factors affecting the eruption time

Several studies have shown variations in the ages at which individual primary teeth erupt as well as variations of eruption pattern between different ethnic and racial groups.^{7,8} Other suggested factors, which affect the eruption time, may include gestational period, diseases, nutritional status, growth and climate. In addition to genetic factors, environmental factors such as maternal smoking, height and weight of a new born at the time of birth and nutrition status has shown to play a role in the eruption of the first primary tooth. A few reports have focused on the discerning effect of nutrition in early age of a child, including breast milk.

Factors affecting eruption:

1. Weight of children:

- Low birthweight: Seow reviewed and identified retardation of dental growth and development in **preterm babies**.³²
- In another study, Seow found that children with a birth weight less than 1000g and gestational ages less than 30 weeks had the greatest lag in dental maturation.⁴²
- Malnutrition: The **extremes of nutritive deprivation** that the effects on tooth eruption have been shown.²⁴⁻²⁶

2. Height: There were also significant associations between the total number of teeth present and height, weight and head circumference in boys; the associations in girls were significant for teeth vs. height. These findings indicate that the timing of deciduous tooth emergence is significantly related to general somatic growth and perhaps nutritional status.⁴³

3. Breast feeding: Exclusive breastfeeding has an overall effect on growth and development of children.⁴⁴ Various studies have noted the effect of breastfeeding habits on orofacial development, including eruption of primary and permanent dentitions.⁴⁵ Larsson et al. found that there was an increased dribble and biting or gnawing activity, especially around the eruption area during teething time.⁴⁶

4. Maternal age: The GUSTO study in Singapore, which uncovered an association between higher maternal childbearing age and earlier eruption timing of first primary tooth in infants.⁴⁷

5. Socioeconomic status: Clemens et al. in 1953 claimed the mean emergence times of children in a higher socio-economic group tended to be earlier than those in other children.⁴⁸

6. Climate : Al-Jasser NM et al considered many reasons as influential factors on the time and order of teeth emergence. These include nutrition, socioeconomic status, sex, climate, and premature extraction of the deciduous teeth.⁴⁹

7. Race: A study of dental patterns among Saudi Arabian children showed that they experienced delayed first primary tooth eruption when compared to Caucasian children (including children from Iceland and US).⁴⁹

8. Diseases: The dentofacial changes in cretinism are related to the degree of thyroid deficiency.²⁷⁻²⁹ In hypopituitarism or pituitary dwarfism, the eruption and shedding of the teeth are delayed, as is the growth of the body in general.^{27,30,31} Other systemic conditions associated with impairment of growth, such as **anemia** (hypoxic hypoxia,³⁵ histotoxic hypoxia, and anemic hypoxia)³⁵ and renal failure,³⁶ have also been correlated with Delayed Tooth Eruption and other abnormalities in dentofacial development.

Several studies have considered influential factors such as nutrition, socio-economic status climate, and premature extraction of deciduous teeth on the time and order of the emergence of teeth, but the results were inconsistent.^{8, 9} For example, Clemens et al. (1953) claimed the mean emergence times of children in a higher

socio-economic group tended to be earlier than those in other children.¹⁰ Furthermore, other studies suggested a genetic origin for early or late emergence of teeth. 11-14 But Lee et al. (1965) emphasized

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Comparison between eruption pattern in Saudi Arabia

A study by Al-Jasser NM et al.⁴⁹ compares the eruption pattern in the children of Saudia Arabia. For both the maxilla and mandible, there were no differences in the mean age of eruption of the teeth in the right and left sides; hence, they were combined. The mandibular central incisors were the earliest category of teeth to erupt with a mean age of about 8.5 months for both genders. A standard deviation of 2.8 months suggests 68% of the children would have their teeth erupted between 5.7 months and 11.3 months. The maxillary central incisors erupted at about 11 months followed by the maxillary and mandibular laterals respectively. The first molars erupted on average earlier than the canines. The mandibular and maxillary second molars erupted at a mean age of about 28 months for both genders. The length of time from eruption of the first tooth to the last tooth was 19.5 months in the mandible and almost 17 months in the maxilla. The phases of eruption of primary teeth were divisible into 4 active periods: incisors; first molars; canines; and second molars, with an interval of rest between the phases. The first phase comprised central and lateral incisors that erupted within 6 months in both jaws for boys and girls. An interval of about 2.6 months in the mandible and 3.7 months in the maxilla followed before eruption of the first molars. The third phase commenced with eruption of canines after a resting period of 3.9 months in the mandible and 4.2 months in the maxilla. The last phase was the eruption of the second molars that occurred after a pause of about 6.9 and 7.1 months in the mandible and maxilla respectively. There is a tendency for the teeth to erupt earlier in boys in both the maxilla and mandible. The results of this study were compared to those of similar studies involving varying racial and ethnic groups. They suggest a slightly delayed eruption of the teeth in Saudi children compared to those of Caucasian children, but the results were similar to those reported for Iraqi children.⁴⁹

Conclusion

Variation in the normal eruption of teeth is a common finding, but significant deviations from established norms should alert the clinician to further investigate the patient's health and development. Delayed tooth eruption might be indication of a systemic condition or an indication of altered physiology of the craniofacial complex.

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None.

Conflicts of interest

The author declares that there is no conflict of interest.

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