World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

Relationship between preterm birth and low birth weight with delayed tooth eruption

Calista Arin Parahita [1,*], Ananda Azmyi Zuleika [1] and Pratiwi Soesilawati [2]

[1] *Faculty of Dental Medicine, Airlangga University, Surabaya, Indonesia.*
[2] *Department of Oral Biology, Faculty of Dental Medicine, Airlangga University, Surabaya, Indonesia.*

World Journal of Advanced Research and Reviews, 2025, 26(02), 404-409

Publication history: Received on 14 March 2025; revised on 03 May 2025; accepted on 05 May 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.26.2.1646

Abstract

According to the World Health Organization (WHO), there are approximately 15 million preterm births each year. Preterm births usually have low birth weight (LBW). Both of these factors can disrupt the overall development of the child and cause delayed eruption of primary teeth. This study aims to review the literature regarding differences in tooth eruption patterns or tooth growth and development in low birth weight preterm- birth infants with normal birth weight infants. This literature review discusses the identified relationship between preterm birth and low birth weight with tooth eruption patterns. In addition, there are other factors that also affect the tooth eruption pattern. Based on the results of the literature review, it is shown that preterm or low birth weight infants have a different tooth eruption pattern or growth and development of teeth than normal or normal birth weight infants. However, there are also several journals that state that there is no relationship between these two factors.

Keywords: Preterm birth; Prematurity; Low birth weight; Tooth Eruption; Delayed tooth eruption

1. Introduction

Preterm births usually have low birth weight (LBW) [1]. Low birth weight is a baby born with a birth weight of <2,500 grams [2]. On a global basis, the prevalence of low birth weight was 14.6% in 2000 and increased to 17.5% in 2015. In 2015, approximately 20.5 million births involved children with low birth weight, 91% of whom were from low- and middle-income countries, namely 48% in South Asia and 24% in sub-Saharan Africa [1]. Based on weight, there are 3 groups of preterm births, namely low birth weight (LBW) weighing <2500 grams, very low birth weight (VLBW) weighing <1,500 grams, and extremely low birth weight (ELBW) weighing <1,000 grams [2].

Preterm birth with low birth weight can disrupt general child development [3]. This can result in shorter prenatal developmental time than it should be, as well as risking various neonatal complications and problems in the development of other organs. Preterm birth and low birth weight are also associated with oral tissue structure, namely growth and developmental disorders in primary and permanent teeth which can be in the form of developmental anomalies such as abnormalities in enamel structure, palatal, and smaller tooth size [2].

Preterm birth and low birth weight can cause delayed eruption of primary teeth [1]. Tooth eruption is the process of tooth development that begins to emerge through the soft tissue of the jaw and mucosa to enter the oral cavity [4]. Children's tooth eruption is influenced by several factors, such as duration of pregnancy, type of pregnancy, race, developmental abnormalities, height and weight at birth, hormonal changes, nutrition, and general growth. Delayed tooth eruption is the development of teeth into the mouth at a different time than the normal eruption range. It can be associated with nutrition, environmental factors, and premature birth weight [5].

* Corresponding author: Calista Arin Parahita

The purpose of this article review is to determine whether preterm birth or low birth weight result in different patterns of tooth eruption or tooth growth and development compared to those born at term or with normal birth weight. The hypothesis of this article review is that there is an association between preterm birth or low birth weight and the eruption pattern or growth and development of primary teeth.

1.1 Tooth Eruption

The term "eruption" comes from the Latin word "eruptio", which means "outburst with momentum". Tooth eruption is the process of the tooth moving from its place of formation in the jawbone towards the oral cavity. This process begins at the formation of the tooth germ (odontogenesis) and continues until the tooth reaches its final position in the oral cavity. The term "eruption" is used to indicate when the crown of the tooth enters through the gingiva and begins to be part of the oral cavity, which is only one stage of the physiological process that includes a series of movements that the tooth makes, from its germ to the end of its physiological cycle [6].

Tooth eruption is a complex and ongoing process from the initial formation of the tooth to the final position of the tooth in the oral cavity. The process consists of six phases: initiation, proliferation, morph differentiation, apposition, calcification, and eruption. In primary teeth, eruption is followed by exfoliation, which is the detachment of the tooth from the jawbone. In permanent teeth, eruption is the last phase. Tooth eruption is one of the indicators of tooth growth and development. Knowledge of normal tooth eruption is important to determine whether delayed or accelerated eruption is caused by local, genetic, or systemic factors. Growth and development of teeth are part of the overall growth and development of the body. Growth and development of teeth are influenced by genetic and environmental factors [2].

Tooth eruption is an integral part of the process of child development and promotes physiological stimulation of the stomatognathic system. The mechanisms responsible for the eruption movements have not been fully explained. The relationship between the chronology of this tooth eruption and prematurity and birth weight is not fully understood. The standard eruption stages of primary teeth generally begin with the eruption of the lower central incisors, with the averages described in the literature being 7.68±2.84 months, 8.2±0.8 months, 8.3±3.1 months, and 8.5±2.6 months [3].

Tooth eruption in children is influenced by several factors, including duration of pregnancy, gender, race, developmental abnormalities (such as cleft lip or palate), height and weight at birth, hormonal changes, nutrition, and general growth [5].

1.2 Delayed Tooth Eruption

Delayed tooth eruption is the evolution of teeth into the mouth at a time different from the normal range of eruption. The causes of delayed tooth eruption have been attributed to nutrition, environmental factors, and premature birth weight. The development of primary teeth is usually from mid-pregnancy to the end of the first year of life. The procedure can be disrupted in premature children due to exposure to some medications, nutritional deficiencies, and traumatic oral procedures. Some studies conclude that the eruption time of the first primary tooth is usually delayed in premature infants. The number of teeth is significantly lower in preterm and low-birth-weight low-birth-weight infants compared with normal births, but the entire number of teeth will catch up with normal birth-weight children at around 30 to 36 months of age [5].

As this phenomenon is related to physical development, children with lower gestational age, lower birth weight, and more systemic problems will tend to have delayed eruption of the first deciduous tooth. Daily weight gain, age, breastfeeding, vitamin supplementation, intubation period, and the presence of apnea in premature infants are factors that can interfere with the eruption of primary teeth [6].

1.3 Prematurity

The World Health Organization (WHO) states that preterm birth is a baby born at <37 weeks gestation or pregnancy. Preterm babies generally have a birth weight below 2,500 grams. Preterm birth with LBW results in a shorter prenatal development time than it should be and is at risk of various neonatal complications and problems in the development of other organs [2].

The etiology of preterm birth is multifactorial related to maternal factors, fetal factors, and unknown factors. Maternal factors include maternal age of delivery over 35 years, young mother, smoking mother, hypertension, preeclampsia, multiple pregnancy, and infection. Infections can be located in the teeth caused by viruses or bacteria. Mothers with periodontitis are at risk of delivering premature and LBW babies. There are 3 groups of premature babies based on

weight, namely LBW <2,500 grams, very low birth weight (VLBW) <1,500 grams; and extremely low birth weight (ELBW) if <1,000 grams. Previous research states that there are delays in the physical and psychological development of infants with a history of LBW prematurity, as well as in the structure of oral tissues, namely growth and development disorders in primary and permanent teeth which can be in the form of developmental anomalies such as abnormalities in enamel structure, palatal, and smaller tooth size [2].

The effect of prematurity on the tooth eruption process has been reported, showing a delay in the eruption of the first deciduous tooth in infants born prematurely, when compared with infants born at term or with the average eruption described for children with similar characteristics [3].

Since children born prematurely are not fully mature at the time of birth, their chronological age does not correspond to their actual biological age. Therefore, meaningful comparisons with normal full-term children can only be made if the ages of children born preterm are correlated with the ages of children born earlier. In addition, the evolution of preterm infants differs from the normal population in two fundamental aspects: growth patterns and postnatal development. There are several factors that affect postnatal growth, such as gestational age, nutritional status at birth, nutrient supply, and the intensity and duration of complications [6].

1.4 Low Birth Weight

Low birth weight (LBW) is a baby born with a birth weight of <2,500 grams [2]. Low birth weight is recorded after birth, and ideally measured several hours after birth, before significant postnatal weight loss occurs. Neonates will lose between 3.5% and 6.6% of their birth weight in the first 2.5 to 2.7 days of life [7].

Research by Cutland, et al [7] states that the LBW working group decided birth weight is measured in the first 48 hours of life. Low birth weight is an important and valuable public health indicator for maternal, nutrition, healthcare delivery, and poverty. Neonates with low birth weight have >20 times greater risk of mortality. Low birth weight is also associated with long-term neurological defects, impaired language development, impaired academic achievement, as well as increased risk of chronic diseases including cardiovascular disease and diabetes.

Based on gestation, low birth weight babies can be classified into 2, namely low birth weight of pure prematurity and dysmaturity. Pure prematurity low birth weight babies are those who have a gestation period of less than 37 weeks. At this time, the weight is usually called a neonate less than a month for the gestation period. Meanwhile, dysmature low birth weight babies are low birth weight babies who weigh less than they should during pregnancy. Dysmature LBW can be born in the preterm period (less than month), term period (full term), and post-term period (more than month) [8].

There are several risk factors that influence the incidence of low birth weight, namely socio-demographic characteristics of the mother, such as age less than 20 years and more than 35 years, black race, poor socio-economic status, illegitimate marital status, and low education level. In addition, the incidence of low birth weight can also occur due to maternal medical risks before pregnancy, such as parity, weight and height, previous low birth weight, and birth spacing. Maternal reproductive health status is also at risk for LBW, such as maternal nutritional status, diseases during pregnancy, pregnancy history and pregnancy complications. Antenatal care status, such as the frequency and quality of antenatal care, the health worker where the pregnant woman is examined, the age of the pregnancy at the first examination, and the pregnancy, can also be at risk for LBW [9].

2. Material and methods

The authors used journal references that have been published in 2006-2023. The journals were collected from various online sources such as Google Scholar and Science Direct with the keywords preterm birth; low birth weight, delayed tooth eruption. Sources were selected based on inclusion criteria, namely journals with the type of research article or original article.

3. Results and discussion

Much has been done to improve knowledge about tooth eruption, not only about the chronology and sequence of eruption but also about the causes that can interfere with the eruption process. The literature suggests that factors such as race, gender and physical development can affect tooth eruption. Premature birth and low birth weight may affect general physical development, and it is possible that dental development may also be affected. Premature babies are

not fully developed at the time of their birth. Their chronological age does not correspond to their correct biological age [10].

The study conducted by Ramos, et al [10] showed that there was a significant relationship between birth weight and time of first tooth eruption when chronological age was used. Preterm infants born weighing less than 1,500 grams had delayed first tooth eruption, when compared to infants who weighed between 1,500g and 2,499g and to infants whose birth weight was equal to or higher than 2,500g. This is due to premature birth and not due to delayed tooth development. When normal gestational age was used, no statistically significant differences were found in the three weight groups. The journal also mentioned a positive relationship between tooth eruption and body growth by comparing the mean eruption time between low birth weight and normal birth weight infants where eruption in normal birth weight infants occurred significantly earlier than in low birth weight infants.

The study by Paulsson, et al [11] showed that the development of permanent teeth differs between genders and ethnicities. The study conducted in this journal used radiographic examinations using only Caucasians to reduce potential confounding factors such as ethnic differences, and thus, a homogeneous sample was created. Another strength of this study is that two groups of preterm children have been compared with a control group of infants with normal gestational age. Preterm infants included in the study were included according to gestational age, which was determined by ultrasonography. The results showed that the lower the gestational age, the greater the delay in tooth development at 9 years of age.

Research reported by Khalifa, et al [12] discusses the factors that can affect the eruption time of the first primary teeth, especially gestational age and birth weight and neonatal diseases. Considering the chronological age of premature infants, this study showed a delay in the eruption time of the first primary teeth in premature infants when compared to normal infants.

The results of a study in the journal by Castro, et al [13] showed that there was an association between LBW and delayed eruption in children under 24 months of age. After adjusting for the independent variables of exclusive breastfeeding and uneventful pregnancy, it was found that the overall prevalence (10.29%), and the prevalence found among LBW children (14.71%) was smaller when compared to the results of other studies involving the same age group. While comparing the mean age of eruption between normal weight and low weight infants, it has been examined in the journal that the same occurs significantly earlier in children born with normal weight, with the exception of the maxillary first molar and upper and lower canines. However, it is known that LBW children usually tend to regain growth velocity between 2 and 3 years of age, during the growth recovery or catch-up phase. This phase is characterized by rapid increases in weight, length and head circumference with rapid growth rates, exceeding those of children found in the general population who are full-term or of normal birth weight. Delayed eruption and teething are common in children who are not exclusively breastfed, and the presence of an uneventful pregnancy is an important predictor of child health [13].

In a study conducted by Sayed, et al [5] explained that low body weight at birth has an impact on the eruption time of the first deciduous tooth, which delays the time of tooth eruption in children with low birth weight, but it does not affect the number of teeth that grow, weight, length, or the child's body mass index (BMI). The number of erupted teeth and children's body mass index (BMI) were positively correlated. The first primary teeth that erupted in children did not correlate with their body mass index (BMI).

In a study by Neto & Falcao [6] it was observed that children with low birth weight had delayed tooth eruption, according to lower body weight, length, and head circumference at birth. Children with this condition may also have delayed motor skills. This is an indication that the eruption of primary teeth in children born prematurely has its own developmental pattern, and will return to normal after 2 years. Delayed eruption of primary teeth is related to the child's growth and development. Reduced physical development, children with lower gestational age, lower body weight, and children with more systemic problems may interfere with the eruption of primary teeth.

Like other tissues and organs, prematurity affects facial bones and teeth. Research on enamel damage is due to quantitative changes in enamel, qualitative changes in enamel, or a combination of both. Delayed tooth eruption generally occurs in the first teeth that are undergoing mineralization. Research conducted by Neto & Falcao [6] tested the hypothesis that prematurity and low birth weight can delay tooth eruption. Birth weight is an important variable for survival, growth and development. Premature infants have immature organs. This can put them at high risk for the development of respiratory diseases, hyperbilirubinemia, hypocalcemia, anemia, and other diseases that affect health and development.

A low birth weight child or a gestational age of less than 37 weeks and shows a greater likelihood of delayed eruption of primary teeth. In a study by Neto & Falcao [6] analysis conducted on 40 children born with birth weight less than 1500g (very low birth weight) and gestational age less than 37 weeks showed that the eruption of the first primary teeth occurred at an average chronological age of 11 months and 9.61 months months after being corrected for prematurity. In addition, all children in this study showed first eruption of the mandibular central incisor (81/71), and in 28 children (70%), there was concurrent eruption of the two teeth. In this study, the mean eruption for females was 11 months and, for males, 12 months. When corrected for prematurity, the mean was 9.5 months for females and 9.7 months for males, and there were no differences regarding eruption time for both chronological age (p=0.90) and age corrected for prematurity (p=0.98). The results of this study found no significant difference between tooth eruption by gender [6].

Based on neonatal nutrition at term, the mean chronological age was 12 months for adequately nourished and 11 months for inadequately nourished, with a significant difference (p=0.009). When corrected for prematurity, there was no delay in growth and development with children born at term, but there was a difference in comparison by gender for both chronological age and preterm age. A comparison between the mean age of first primary tooth eruption and nutritional adequacy at birth showed a delayed age of primary tooth eruption in children for gestational age, and this was not confirmed when age of eruption was corrected for prematurity. Based on this study, hereditary and individual factors, such as gender and race, in conjunction with external factors, such as geographical location, socioeconomic status, nutrition, pregnancy problems, and severe maternal diseases may lead to differences in tooth eruption patterns [6].

In research reported by Soewondo & Effendi [2] the growth or development of teeth (odontogenesis) occurs at 4-5 weeks of intrauterine embryonic age, which occurs with a continuous process of initiation, proliferation, morphodifferentiation, apposition, and calcification process called the pre-eruption phase and eruption phase. In this study, the results showed that the eruption of primary teeth occurred later in children with LBW birth history, who started eruption at 12 months of age. Normal children started eruption at 4 to 6 months of age. This delay in eruption is mainly in the first deciduous tooth. Infants born prematurely LBW are at risk of developmental delay and immaturity of organs including teeth. In addition, the delay in tooth eruption is also related to the inhibition of tooth growth and development in the jawbone, so that the pre-eruption phase consists of the processes of initiation, proliferation, morphodifferentiation, apposition, and classification. This is also followed by the delay in the eruption phase, namely the mucosal penetration phase and the occlusal phase of primary teeth, so that the teeth in the mouth are late to appear.

In this study, there was no significant difference between preterm low birth weight (LBW) infants with a history of intrauterine growth restriction (IUGR) and preterm LBW infants with appropriate for gestational age (AGA). In this study, the eruption order of primary teeth in preterm LBW infants was the same as that in normal birth weight infants, only the eruption time was delayed by about 6 months. This difference in eruption time occurred in infancy to children under 6 years of age (early childhood). After the age of 9 years (late childhood), there was no longer a difference in eruption time of permanent teeth in preterm LBW infants and normal birth infants. Based on this study, the eruption time of primary teeth in preterm LBW infants started at 12 months, which was later than that in children with normal birth weight [2].

In the study by Lopes, et al [3] the corrected age was calculated by subtracting the postnatal age from the number of weeks remaining to complete 40 weeks at the time of the child's birth, and then averaging the child's age. Premature births prevent newborn babies from receiving essential nutrients for growth and development as they are already outside the womb. In most of the babies in this study, the first tooth to grow was the lower central incisor, followed by the upper central incisor. This study provides evidence that delayed eruption of the first primary tooth occurs in preterm and low birth weight babies. This study states that males show delayed tooth eruption. Male babies, very low birth weight babies, and low birth weight babies showed delayed chronological eruption of the first primary tooth. Developmental and nutritional variables at birth and during early life may be important for the timing of tooth eruption [3].

Systematic review reported by Portela, et al [1] was conducted using meta-analysis to assess the effect of preterm birth on the mean age (chronological and adjusted) of eruption of the first primary tooth. When chronological age was considered, there was a delay in the eruption of the first primary tooth compared to non-preterm children. However, when adjusted age was considered, that is, the chronological age after birth in weeks minus the preterm adjustment (40 weeks minus gestational age in weeks), no association was found between preterm birth and delayed eruption of the first primary tooth. In a meta-analysis with limited data, it was found that there was no association between low birth weight and age at eruption of the first primary tooth. The results of the systematic review showed that delayed eruption

of the first primary tooth was associated with low birth weight infants with consideration of chronological age. However, no delay in eruption was found in children with low birth weight when adjusted age was considered.

4. Conclusion

The results of this literature review suggest that preterm or low birth weight infants have a different tooth eruption pattern or tooth growth and development than normal or normal birth weight infants. However, some journals also state that there is no relationship between preterm birth and low birth weight and delayed eruption of primary teeth. The results of this literature review can be a guide for mothers to pay more attention to the risk factors for preterm birth in infants, as a preventive effort for preterm birth with low birth weight which may potentially affect the tooth eruption pattern. Further research can be conducted to analyze the causal relationship between preterm or low birth weight infants and delayed eruption of primary teeth.

Compliance with ethical standards

Acknowledgements

The authors express gratitude to the evaluators for their valuable input in reviewing this journal and offering highly significant feedback.

Disclosure of Conflict of interest

No conflict of interest to be disclosed.

References

[1] Portella PD, Marchetti G, Wambier L, Souza JFD, Fraiz FC, Menezes JVNBD, Assunção LRDS. Are Premature Birth and Low Birth Weight Associated with Delay on the Eruption of Deciduous Teeth? A Systematic Review and Meta-analysis. Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2023; 23: 1-15.

[2] Soewondo WS, Effendi SH. Erupsi Gigi Sulung pada Anak dengan Riwayat Lahir Prematur, Berat Badan Lahir Rendah. Majalah Kedokteran Bandung. 2014; 46(1): 34-38.

[3] Lopes TSP, Lima CCB, Lima MDDM, dos Anjos MC, Machado KSV, Moura LFAdD, Moura MSd. Are prematurity and low birth weight associated with a delay in the chronology of the eruption of the first tooth? International Journal of Development Research. 2022; 12(5): 55828-55832.

[4] Amalia IR, Prasetyowati S, Larasati R. Faktor Resiko Keterlambatan Erupsi Gigi Sulung. Jurnal Ilmiah Keperawatan Gigi. 2021; 2(3): 603-611.

[5] Sayed HM, Elchaghaby MA, Omar OM. Eruption status of primary teeth and BMI in low birth weight children in comparison to normal birth weight children. Advanced Dental Journal. 2023; 5(2): 210-217.

[6] Neto PG, Falcão MC. Eruption chronology of the first deciduous teeth in children born prematurely with birth weight less than 1500g. Revista Paulista de Pediatria. 2014; 32(1): 17-23.

[7] Cutland CL, Lackritz EM, Mallett-Moore T, Bardají A, Chandrasekaran R, Lahariya C, Brighton Collaboration Low Birth Weight Working Group. Low birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization safety data. Vaccine. 2017; 35(2017): 6492-6500.

[8] Afifah I. Hubungan Usia Ibu dan Paritas dengan Bayi Berat Badan Lahir Rendah (BBLR) di RS Muhammadiyah Surabaya [Dissertation]. Surabaya: Universitas Muhammadiyah Surabaya; 2020.

[9] Indrasari N. Faktor resiko pada kejadian berat badan lahir rendah (BBLR). Jurnal Ilmiah Keperawatan Sai Betik. 2012; 8(2): 114-123.

[10] Ramos SRP, Gugisch RC, Fraiz FC. The influence of gestational age and birth weight of the newborn on tooth eruption. Journal of Applied Oral Science. 2006; 14(4): 228-232.

[11] Paulsson L, Arvini S, Bergström N, Klingberg G, Lindh C. The impact of premature birth on dental maturation in the permanent dentition. Clinical Oral Investigations. 2019; 23: 855-861.

[12] Khalifa AM, El Gendy RA, Abd El-Mohsen MM, Hammour AA, Aly RSAE. L. Relationship between gestational age, birth weight and deciduous tooth eruption. Egyptian Pediatric Association Gazette. 2014; 62(2): 41-45.

[13] Castro CRDS, Cabral MBBDS, Mota ELA, Cangussu MCT, Vianna MIP. Low birth weight and the delay on the eruption of deciduous teething in children. Revista Brasileira de Saúde Materno Infantil. 2019; 19(3): 701-710.