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ORIGINAL ARTICLE

Effect of Perinatal Outcomes on the Stage of Primary Dentition Eruption

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Abstract

Background/Aim: Understanding how perinatal outcome variations affect dentition eruption can lead to healthcare providers monitoring and managing dental health in infants and children. This study aimed to evaluate the influence of gestational age, mode of delivery and birth weight on the stage of primary dentition eruption in children.

Methods: A sample of 304 children aged 6-24 months from Baghdad City was studied. Information about gestational age, delivery method (vaginal vs Caesarean) and birth weight were evaluated through a parent- answered sheet. The stage of dental eruption was estimated based on the criteria established by Damodar P Swami. Statistical and descriptive analyses were utilised to compare the dental eruption stages across different groups.

Results: Most of the study population (62.8 %) exhibited eruption stage 3 and statistical analysis revealed no significant differences in eruption stage when compared across variable groups, including gestational age, delivery method and birth weight.

Conclusion: Results indicate the possible early effects of birth weight during eruption of deciduous teeth in young infants (6-11 months). This potential effect appears to decrease with age and was not statistically significant in older age. In contrast, gestational age and mode of delivery showed no significant effects on the stage of deciduous teeth eruption. These results provide valuable insights to paediatric dentists.

Key words: Birth weight; Gestational age; Parturitions; Tooth eruption, primary.

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Introduction

The stage of primary dentition eruption marks a significant milestone in a child's development. Primary teeth, also known as deciduous or baby teeth, typically begin to emerge around the age of six months and continue to erupt until about the age of three.[1] This process is essential for the infant's ability to chew and speak and plays a critical role in the proper arrangement and spacing of the permanent dentition that will follow.[2] Eruption of teeth is a growth process of the body and then has a relation to other body processes.[3, 4]

Genetic and environmental factors together[5] influence the eruption of primary teeth. While genetics primarily dictate the timing and sequence of tooth emergence, various external factors such as nutrition, health status and even socioeconomic conditions can play a role.[6, 7] Study[8] found that an infant's nursing pattern did not significantly impact the stage of primary dentition eruption. However, contrary findings from other research[9] suggest that nutritional status is more substantial in influencing primary dentition eruption.

However, external environmental factors (nutrition, overall health, birth weight, socioeconomic factors and cultural practices) have a significant impact on the timing of the primary dentition eruption.[10]

Exploring the relationship between perinatal outcomes and primary dentition eruption not only enhances our comprehension of early childhood development but also underscores the importance of maternal and infant health during the perinatal period. By identifying the critical perinatal factors affecting tooth eruption, healthcare professionals can better anticipate and manage potential dental and developmental issues in early childhood.[11] The influence of perinatal factors on primary dentition eruption is essential for paediatric healthcare providers, as it can inform early interventions and strategies to support optimal dental and overall health outcomes in children. Since there are no Iraqi studies concerning the relationship between perinatal components and tooth eruption for primary dentition, it was chosen to conduct this study to evaluate the influence.

The aim of this study was to clarify the impact of gestational age, mode of delivery and birth weight on the stages of eruption of primary teeth in children aged 6 to 24 months.

Methods

Parents of children obtained written informed consent before being involved in the study. A cross-sectional observational study was conducted on 304 healthy medically fit children of both genders, aged 6-24 months. Participants were chosen based on the inclusion criteria of this study using simple random sampling. The sample size was estimated using *G Power* 3.1.9.7.[12] Based on a power of 95 %, a two-sided alpha error probability of 0.05 and medium effect size (F = 0.25) for three groups, the *G Power* calculation indicated a required sample size of approximately 250 subjects; therefore, 304 children was enough and more than the calculated *G Power*.[13]

Participants were recruited from two sources inside Baghdad City: children attending a Specialist Health Centre and those enrolled in local nurseries. Exclusion criteria were diagnosed chronic systemic disease affecting tooth eruption and treatment with medication known to interfere with tooth development (eg, corticosteroids). Participants with congenital craniofacial and oral anomalies (eg, cleft lip/palate, enamel hypoplasia, natal/neonatal teeth, supernumerary teeth, or odontomas) that could directly affect the normal eruption of the teeth and those who were uncooperative in oral examination, which precluded an accurate evaluation, were also excluded from the study.

An information sheet was employed to collect data on the following perinatal variables:

- Gestational age: classified into premature (less than 37 weeks), full-term (37–42 weeks), or post-term (more than 42 weeks);
- Mode of delivery: classified as vaginal delivery or Caesarean section;
- Birth weight: classified into underweight (less than 2500 g), normal weight (2500–4000 g) and overweight (more than 4000 g).

Calibrated examiners performed full-mouth oral examinations with a disposable dental mirror. These examinations were performed under natural sunlight. Before data collection, the examiners were calibrated to standardise the examination procedure and to ensure uniform application of the tooth eruption classification criteria. The reliability of the assessments was verified by Cohen's Kappa values of 0.861 for inter-examiner calibration and 0.875 for intra-examiner calibration, indicating substantial to excellent agreement.

A tooth was classified as erupted if the cusp tip or incisal edge had emerged through the gingiva. The tooth eruption stages were categorised according to the classification of Swami et al:[14]

- Stage 0: The tooth is not observable in the oral cavity;
- Stage 1: At least one cusp is obvious in the oral cavity;
- Stage 2: The entire occlusal surface or mesiodistal width of the tooth is evident;
- Stage 3: The tooth is at the occlusal level or in occlusion if the antagonistic tooth has not fully erupted.

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS version 21, Chicago, IL, USA). Descriptive data were presented with counts and percentages,

minimum and maximum, means and standard deviations (SD), medians and mean ranks, representative samples and Shapiro-Wilk test, Kruskal-Wallis and Mann-Whitney U test type values. Statistical significance was defined as $p < 0.05$.

Results

The distribution of study participants across the most important demographic and clinical variables is shown in Table 1.

Table 1: Distribution of study participants by demographic and clinical variables

Variables N (%)	N	%
Delivery	Vaginal delivery	26.64
	Caesarean	73.36
Age (months)	6-11	37.83
	12-18	38.82
	19-24	23.36
Birth weight	Underweight	15.46
	Normal weight	75.99
	Overweight	8.55
Gestation time	Preterm	24.01
	Full term	57.24
	Post term	18.75
Eruption stage	0	12.17
	1	11.51
	2	13.49
	3	62.83

Table 2 demonstrates the impact of gestational age on eruption. The median eruption stage was 3 across all gestational age categories. The mean ranks for preterm, full-term and post-term groups were 141.30, 158.55 and 148.37, respectively. Kruskal-Wallis tests demonstrate that there were no statistically significant variations when comparing cross gestational age groups in the eruption stage, either overall (KW = 2.862, p = 0.239) or within specific age subgroups (6-11 months: KW = 0.451, p = 0.798; 12-18 months: KW = 2.943, p = 0.230; 19-24 months: KW = 0.997, p = 0.607).

Mann-Whitney U tests revealed no statistically significant differences in eruption stages between children born via vaginal delivery and those born via Caesarean section, either overall (U = 0.570, p = 0.569) or within specific age subgroups (6-12 months: U = 1270.000, p = 0.596; 13-18 months: U = 1099.000, p = 0.775; 19-24 months: U = 530.000, p = 0.236) as shown in Table 3.

In the 6–11-month age group, a trend towards a significant difference in eruption stages among

Table 2: Comparative analysis of eruption stages across gestational age groups

Age group (months)	Preterm			Full term			Post-term			KW	p-value
	N (%)	Median	Mean	N (%)	Median	Mean	N (%)	Median	Mean		
6-11	29 (25.22)	1	54.59	63 (54.78)	1	59.42	23 (20.00)	2	58.41	0.451	0.798
12-18	31 (26.30)	3	53.60	66 (55.93)	3	62.27	21 (17.80)	3	59.52	2.943	0.230
19-24	13 (18.31)	3	34.69	45 (63.38)	3	35.94	13 (18.30)	3	37.50	0.997	0.607
Total	73 (24.01)	3	141.30	174 (75.24)	3	158.55	57 (18.75)	3	148.37	2.862	0.239

KW: Kruskal-Wallis test;

Table 3: Comparative analysis of the stages of eruption between delivery methods

Age group (months)	Vaginal delivery			Caesarean section			MWU	p-value
	N (%)	Median	Mean	N (%)	Median	Mean		
6-11	33 (28.70)	1	55.48	82 (71.30)	2	59.01	1270.000	0.596
12-18	24 (20.34)	3	60.71	94 (79.66)	3	59.19	1099.000	0.775
19-24	24 (33.80)	3	34.58	47 (66.20)	3	36.72	530.000	0.236
Total	81 (26.64)	3	148.38	223 (73.36)	3	154.00	0.570	0.569

MWU: Mann-Whitney U test;

Table 4: Descriptive and statistical tests of eruption stages by birth weight

Age group (months)	Underweight		Normal weight		Overweight		KW	p-value
	Median	Mean	Median	Mean	Median	Mean		
6-11	0	50.53	1	57.06	2	77.00	4.802	0.091
12-18	3	56.29	3	59.74	3	64.15	0.814	0.666
19-24	3	37.50	3	35.63	3	37.50	0.758	0.685
Total	3	149.64	3	151.40	3	167.46	1.125	0.570

KW: Kruskal-Wallis test;

birth weight categories was observed (KW = 4.802, p = 0.091). However, this result did not reach statistical significance at the conventional 0.05 level. Statistically, no significant variations were found in the 12-18-month and 19–24-month age groups. Overall, no significant variations were observed in stages of eruption among birth weight categories (KW = 1.125, p = 0.570) as shown in Table 4.

Discussion

In presented study on the relationship between several perinatal factors and the eruption stage of primary dentition in children aged 6- 24 months revealed no statistically significant associations with either mode of delivery or gestational age. While birth weight categories showed some observed variations, particularly in the 6–11-month age group, these differences did not achieve the conventional statistical significance threshold ($p < 0.05$).

The lack of a significant relationship between gestational age and eruption stage contrasts with a previous study[15] that reported that gestational age, especially preterm, affects dental development. The basic reason for this inconsistency can be due to contrasts in research design, population characteristics, or evaluation approaches. Therefore, larger population-based studies with standardised methods are needed to clarify the exact type of relationship between gestational age and dental development.

Additionally, there is a lack of significant difference in the developmental stages of children born from vaginal birth versus Caesarean delivery is reliable with Aktoren et al.[16] In contrast, Devraj et al[17] also detailed delay in the eruption of teeth of teeth in children born by Caesarean section. These conflicting results highlight the need for cautious translation and the significance of future research utilising bigger, more diverse populations and uniform assessment protocols to provide the final findings. Results show that birth weight in childhood (6-11 months) has a significant effect on primary tooth development. Previous studies show that dietary somatic growth and health have a major impact on primary teeth development.[18] Low birth weight indicated an inadequate foetal diet and was used as a device to measure intrauterine nutritional status. Furthermore, children suffering from malnutrition are slow in major dental development.[19] Interestingly, presented study found a trend in statistically significant differences in eruption stages between 6-11 months of birth weight categories in age groups (p = 0.091). This indicates that birth weight can affect early deciduous teeth eruptions. This aligns with findings reported by Syed Khaja Aliuddin[20] and Aktoren et al,[16] a correlation was observed between birth weight and eruption stages. Besides, the observed relationship between low birth weight and potentially delayed eruptions corresponds to the possibility that trophic factors and premature infants may influence dental development.[21] The lack of significant differences in eruption stages in the birth weight category of the age group indicates that the potential effect of birth weight on dental development may decrease with age at the 12-18- and 19-to 24-month age groups. This observation supports the concept of catching up, as proposed by SEOW.[22] However, several studies have shown that birth weight may affect dental development in later childhood.[23] These inconsistencies highlight the need for longitudinal studies on a broad assessment of the long-term effects of birth weight on dental development.

This study offers valuable insights into tooth eruption patterns among young children in Baghdad. However, it has inherent strengths and limitations that warrant consideration when interpreting its findings. Strengths of this study include ethical rigor, standardised examination

protocol, comprehensive perinatal data collection and adequate sample size for descriptive purposes. However, primary limitations include its limited generalisability beyond Baghdad and the non-inclusion of other potentially influential factors such as maternal health, breastfeeding duration, or detailed nutritional status, so essential for further research, particularly into the impact of nutritional conditions on tooth eruption.

Conclusion

This cross-sectional study showed that gestational age and birth mode of children between 6 and 24 months had no significant effect. In recent infants (6-11 months), a major trend of linkage was observed between birth weight and eruption stages. Still, this effect did not achieve statistical significance at the conventional 0.05 level and appeared to decrease with age. These results suggest that birth weight can play a part in early deciduous teeth eruptions, but other variables are more persuasive as children mature. Further longitudinal studies with much greater differences in populations and standardised assessment methods are needed to fully clarify the complex interactions between perinatal factors and dental development.

Ethics

The Scientific Committee of the Pedodontics and Preventive Dentistry Department and the Central Ethical Committee of the College of Dentistry at the University of Baghdad, Iraq, gave approval for this study project No 993324, dated 26 December 2024.

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None.

Conflicts of interest

The author declares that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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Software: HNY
Formal analysis: HNY
Investigation: HNY
Resources: HNY
Data curation: HNY
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