Original Article

Eruption Status Of Primary Teeth And BMI In Low Birth Weight Children In Comparison To Normal Birth Weight Children : A Cohort Study

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Abstract

Aim: This study aimed to detect the status of eruption of primary teeth and BMI among children aged 6 to 36 months having low weight at birth compared with children with normal weight.

Methodology: A total of 81 children (38 children in the lower birth weight group LBW and 43 children in the normal weight group NBW) participated in this study. Besides clinical examination, data was collected via a personal interview with the children's mothers or guardians. For every child, the weight and height were measured, the BMI was calculated, and the type and erupted teeth numbers were obtained. The collected data were finally statistically analyzed.

Results: No statistically significant differences (p>0.05) in the number of erupted teeth among the two groups at different ages. Regarding the time of the first erupted tooth, the LBW group had a significantly higher value than the NBW group (p=0.033), denoting a later eruption date. No statistically significant difference was found among both groups (p>0.05) regarding weight, length, and body mass index. There was a positive correlation between children's body mass index (BMI) and erupted teeth numbers. No statistically significant relationship existed between BMI and the timing of the emergence of the first tooth. (p>0.05).

Conclusions: Birth weight did not affect the erupted teeth numbers but affected the time of eruption of the first primary tooth. Regarding eruption status, normal birth weight (NBW) children have a higher percentage of cases with normal eruption than low birth weight (LBW) children.

 KEYWORDS: Tooth eruption, primary teeth, low birth weight, and children

I.   INTRODUCTION:

The emergence of the tooth is referred to the motion of the germ of the tooth from its un-effective placement in the bones of the jaws to its latest station in the mouth. The formation of the eruption pathway is guided by multiple factors, such as biological, chemical, anatomic structures, and molecular mediators (Jain & Rathee, 2021).

Mothers of children with low weight at birth are concerned about when the first tooth erupted. The eruption of primary teeth begins roughly at 4 to 8 months of life by the lower incisors

eruption. It is accomplished roughly 24 to 36 months of life (Al-Batayneh et al., 2015).

Tooth eruption in children is affected by several factors, including the duration of pregnancy, gender, race, developmental abnormalities (such as cleft lip or palate), body height and weight at birth, hormonal changes, nutrition, and general growth (Poureslami et al., 2015).

Teeth eruption delay is the tooth evolution into the mouth at a different time than the normal range of eruption. Causes of delayed tooth eruption have been attributed to nutrition, environmental factors, and preterm birth weight (Jairam et al., 2020).

Primary teeth development is typically from midgestation till the end of the first year of a lifetime. That procedure could be impaired in preterm children due to exposure to some medications, nutritional deficiencies, and traumatic oral procedures (Zaidi et al., 2015).

Several studies concluded that the time of eruption of the first primary tooth is usually delayed in preterm infants. The number of teeth is significantly low for preterm and low birth weight children compared to normal birth children, but the whole number of teeth will be caught up with normal birth weight child by roughly 30 to 36 months of age (Wang et al., 2019; Sadauskaitė et al., 2021).

Therefore this study aims to detect the status of the eruption of primary teeth and BMI among children aged 6 to 36 months having low weight at birth compared with children with normal weight at birth.

II. MATERIALS AND METHODS

Study design and setting:

This study is an observational retrospective cohort study that assessed and compared the eruption status of primary teeth and BMI in a group of Egyptian children aged from 6-36months with low birth weight compared to normal birth weight children in health care centers affiliated with the ministry of health in Cairo governorate.

Participants:

Inclusion criteria:

• Apparently children with good health.

• Age of children from 6 to 36 months.

• Both genders enrolled.

Exclusion criteria:

• Parents refuse to participate.

• Systemic disease or any congenital deformity that could affect teeth emergence.

Trial registration:

The protocol was registered on clinical trials.gov with the register number NCT04343846.

Ethics Comittee Approval

The protocol was reviewed and approved by the Research Ethical Committee, Faculty of Dentistry, Cairo University concerning the scientific content and compliance with applicable research and human subjects regulations with the approval number (13 - 6 – 20).

Sample size:

An effect size (d) of (0.678) was calculated based on Yassin, Heba N., and Maryam Azat A. Rifat. -in which the (Mean±SD) values of the mean number of deciduous teeth in under and normal-weight neonates were (7.6±4.03) and (10.33±4.033), respectively-. By adopting an alpha (α) level of 0.05 (5%), a beta (β) level of 0.20 (20%), i.e., power=80%, and using the calculated effect size (d=0.678); the predicted sample size (n) was found to be a total of (72) cases, i.e. (36) for each Group. Calculation of sample size was performed using G*Power version 3.1.9.2

Data sources and management:

Data were collected through a personal interview with the children's mothers or guardians and by clinical examination of normal birth weight children (NBW) and low birth children (LBW).

Personal interviews:

The study aim was explained to the mothers or guardians of children to alleviate any concerns. The following data were recorded: A. Personal data including child name, gender, guardian name, age at months, home address, and phone number. B. Time of first erupted tooth at months. The children's weight at birth was noted from Egyptian health care centers records and documents. A child was considered of Low birth weight (LBW) if the birth was equal to or less than two and a half (≤2.5kg), according to **Hughes et al., 2017**.

Clinical examination:

All children were examined to assess their weight, height, and body mass index. In addition, a dental examination was performed for the assessment of the type and number of erupted teeth.

A.Weight, length, and body mass index(BMI)

a-Weight:

- The principal investigator measured the children's weight with the help of a specialized nurse in the vaccination room. The children's weight was measured using a digital pediatric scale (LAICA baby weighting scale Mod. BF2051 Made in PRC). The children's weight was measured in kilogram (kg) up to the nearest 10 gm. Each child was weighed with minimal clothes (without a jacket). The weight of children was obtained by sitting or lying down on the scale.

b-Length:

- The principal investigator measured children's length with the help of a specialized nurse in the vaccination room. The children's length was measured using a calibrated tape. Every child lay down on the calibrating tape with the child's back and knees straight and the feet together. Older children were standing up during length measuring. The length of every child was measured in cm from head to heels, up to the nearest millimetre.

C-Body mass index (BMI):

Each child's body mass index [BMI] was calculated as the ratio of their weight [in kg] to the square of height [in m]

B.Dental examination:

- Dental examination was carried out visually on the dental units present in health care centers. Children below one year were examined on their mother or guardian's arm. Children above one year were examined on a dental chair with the mother holding the child for reassurance. Oral examination was performed visually to determine the number and type of erupted teeth. According to **(Elkhatib et al., 2021)** a primary teeth was deemed emerged when the cusp tip or the incisal edge appears throughout the gum. The erupted teeth were identified and counted in each quadrant. Mothers were questioned regarding the child's first tooth's emergence date or age. The time of eruption of the first primary tooth was recorded in months. The collected data and oral examination findings were registered in a patient information form.

III. RESULTS

A. Statistical analysis:

Statistical analysis was performed with R statistical analysis software version 4.1.1 for Windows **(Bunn & Korpela, 2013).** The significance level was set at p≤0.05 within all tests. All participants were subjected to the same examination. They were explored for normality and variance homogeneity using Shapiro-Wilk and Leven's tests, respectively.

Demographic data

A total of 81 children (38 children in the lower weight at birth group LBW and 43 children in the normal weight at birth group NBW) participated in the present study. Regarding gender distribution, no statistically significant difference was found between both groups (p=0.475).

Status of primary teeth eruption

Number of erupted teeth

No statistically significant difference was found (p>0.05) in the number of erupted teeth between two groups and genders (Table 1).

Time of the first erupted tooth

Overall, the LBW group had a significantly statistically higher value (mean age in months) at the time of the first erupted tooth than the **NBW** group (p=0.033). For both genders, no statistically significant difference in the time of the first erupted tooth was found (p>0.05) (Table 2)

Children BMI.

For both genders and the overall Group, no statistically significant difference between both groups was found (p>0.05) regarding BMI (Table 3).

Correlation between BMI and the number of erupted teeth

LBW had a moderate positive correlation between BMI and the number of erupted teeth. For females in the NBW group, there was a weak positive correlation between BMI and the number of erupted teeth (table 4)

Correlation between BMI and the time of first tooth eruption

For both genders and the overall Group, no statistically significant correlation between BMI and the time of first tooth eruption was found. (p>0.05) (Table5).

Intergroup comparison of eruption status

For all categories, no significant statistical difference between both groups was found (p>0.05) (Table 6)

IV. DISCUSSION:

Tooth emergence timing is multifactorial. Various general factors have been suggested to influence dental eruption in healthy children. These include race, sex, and physical development. The BMI of a child is also one factor that has a major impact on dental and skeletal development **(Pavičin et al., 2016)**.

Similarly, Low birth weight and preterm birth are variables that could influence the child's physical growth and dental growth. Because low birth weight and prematurity of birth may influence general physical development, dental development may likely be correspondingly affected. Still, scarce studies have studied this issue, and scarce studies have related the time of the tooth eruption to birth weight and BMI (**Verma et al., 2017)**.

Although various studies have been concerned about the eruption time of primary teeth and independent variables that affect the emergence of primary teeth, there are scarce studies concerning the correlations of the multiple variables on subjects from the Middle East **(Warren et al., 2016)**. Therefore, this study aimed detect the status of eruption of primary teeth and BMI among children age 6 to 36 months having low weight at birth compared with children with normal weight at birth.

Regarding the number of erupted teeth, there was no statistically significant difference in teeth number between the normal birth weight group and low birth weight group and between genders in all age categories. This was in accordance with **Alnemer et al., 2017** who concluded that no association between weight at birth and the erupted primary teeth numbers was found. However, these findings disagreed with **Wang et al., 2019** who found that there is a negative relation between the erupted teeth numbers in preterm in comparison to full-term children but the number of teeth in infants with

low birth weight catches up to that of infants with normal birth weight.

Regarding the timing of the first erupted tooth, overall, the LBW group had a significantly statistically higher value in the time of the first erupted tooth than the NBW group (p=0.033). For both genders, no statistically significant difference in the time of the first erupted tooth was found (p>0.05). This was consistent with **Wu et al., 2019** study in which children with low birth weight emerged their first tooth later than children with normal birth weight.

On the contrary, **Lam et al., 2016** reported that there is no significant difference in the timing of emergence of the primary teeth and birth weight.

This discrepancy could be explained by the fact that the eruption time of the first primary tooth could not be properly obtained from the scarce articles on primary teeth as the eruption time of the first primary tooth is population-dependent (**Hughes et al., 2007**).

Regarding weight, length, and body mass index in the current study, there was no statistically significant difference between both groups (p>0.05) for both genders and overall groups. The results of the present study were against **Gonçalves et al., 2014** who concluded that low birth weight led to lower body measurements. However, **Yuan et al., 2015** stated that very low weight at birth was related to a little increase in children's and teens' chance of developing central obesity.

A possible explanation for this result could be that preterm small for gestational age children grew faster in body height and body weight than full-term small for gestational age children. (**Olbertz et al., 2019**).

Examining the correlation between the BMI and erupted teeth numbers, for LBW, there was

a moderate positive correlation between BMI and the number of erupted teeth. Similar to our findings, **Soliman et al., 2012** reported that all anthropometric parameters showed a relationship with the number of teeth at different levels.

On the other hand, **Shaweesh & Al-Batayneh, 2018** found that there is no correlation between measures of anthropometry such as height and weight and the erupted primary teeth numbers, and just the extremities of weight and length were related to the eruption of primary teeth.

Regarding the relation between BMI and the time of first tooth emergence for both genders and overall, no statistically significant relationship between BMI and the time of first tooth emergence was found (p>0.05). Similar to this study's results, **DuPlessis et al., 2016** found that BMI percentile and ethnicity are poor predictors of dental age and chronologic age. On the contrary, **Nicholas et al., 2018** reported that high body mass index (BMI) values at young ages predict advanced dental development later. Those controversies can be attributed to the difference in the study sample size, different populations, and different geographic areas.

Regarding the intergroup comparison of eruption status, there was no statistically significant difference for all categories (male, female and overall) between the two groups. Similar to our results, **Alnemer et al., 2017** stated that there is no correlation between weight at birth and the erupted primary teeth numbers. On the contrary, **Verma et al., 2017** stated that children with very low birth weight (below 2 kg) showed a considerable delay in primary tooth emergence compared to children with low birth weight and children with normal birth weight.

Table (1) Number of erupted teeth in both groups

Gender	Number of erupted teeth (mean±SD)		p-value
	LBW	**NBW**	
Male	7.05±5.92	6.38±5.23	**0.905ns**
Female	8.72±7.99	7.11±5.98	**0.748ns**
Total	7.84±6.93	6.70±5.52	**0.682ns**

Table (2) Timming of first erupted tooth in months in both groups

Gender	Time of first erupted tooth (months) (mean±SD)		p-value
	LBW	NBW	
Male	8.38±1.82	7.11±1.76	0.074ns
Female	8.62±2.13	7.47±1.9	0.228ns
Overall	8.50±1.95	7.28±1.83	0.033*

Table (3) Comparison of BMI in both groups

Gender	BMI (mean±SD)		p-value
	LBW	NBW	
Male	13.72±1.41	13.42±1.34	**0.476ns**
Female	12.83±2.06	13.86±1.31	**0.076ns**
Overall	13.30±1.78	13.62±1.33	**0.364ns**

Table (4) Correlation between BMI and number of erupted teeth in both groups

Gender	Group	r_s	p-value
Male	LBW	0.542	<0.001*
	NBW	-0.054	0.804ns
Female	LBW	0.653	0.003*
	NBW	0.481	0.037*
Overall	LBW	0.554	<0.001*
	NBW	0.218	0.161ns

Table(5) Correlation between BMI and and timing of eruption of the first tooth in both groups

Gender	Group	r_s	p-value
Male	LBW	0.148	0.585ns
	NBW	0.043	0.860ns
Female	LBW	0.174	0.520ns
	NBW	0.460	0.063ns
Overall	LBW	0.158	0.388ns
	NBW	0.302	0.074ns

Table(6) Intergroup comparison of eruption status

Gender	Eruption		LBW	NBW	Relative risk (95%CI)	p-value
Male	**Normal**	**n**	74	87	0.55 (0.18:1.71)	0.389ns
		%	94.9%	90.6%		
	Delayed	**n**	4	9		
		%	5.1%	9.4%		
Female	**Normal**	**n**	66	73	2.11 (0.55:8.13)	0.318ns
		%	91.7%	96.1%		
	Delayed	**n**	6	3		
		%	8.3%	3.9%		
Overall	**Normal**	**n**	140	160	0.96 (0.43:2.15)	1ns
		%	93.3%	93.0%		
	Delayed	**n**	10	12		
		%	6.7%	7.0%		

*; significant ($p \leq 0.05$) ns; non-significant (p>0.05

V. CONCLUSIONS

Within the limitations of this study, we can conclude that:

Low weight at birth impacts the timing of eruption of the first primary tooth, delaying the eruption time in low birth weight children, but it does not affect the erupted teeth numbers, child weight, length, or body mass index (BMI). The erupted teeth numbers and children's body mass index (BMI) correlated positively. The first erupted primary tooth in children did not correlate with their body mass index (BMI).

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