

# Association of Emergence Time of First Deciduous Tooth with Anthropometric Measurements among Infants of Kolar District, Karnataka

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## ABSTRACT

**Introduction:** Tooth eruption is an important milestone of human growth and development. In the past few years, a delayed emergence of the deciduous tooth is observed. Anthropometric measurements are an important tool used to assess infants' growth and development.

**Objective:** To study the association of emergence time of first deciduous tooth with height, weight (Wt), and head circumference (HC) among infants of Kolar District.

**Materials and methods:** An observational study comprising 154 infants between the age group of 5 and 12 months was considered. Infants with the presence of at least one emerging first deciduous tooth brought to the Hospital of Kolar district for routine vaccinations were examined. Data were collected for a period of 6 months. Infants were subjected to anthropometric measurements that comprised of HC, Wt, and length (Lt) recorded along with birth weight (BW) for further analysis. Statistical analysis was carried out using descriptive and inferential statistics using SPSS version 21. The student's *t*-test was used for assessment of statistical significance.

**Results:** Of the 154 infants examined, tooth emergence (TE) age of lower central incisor (LCI) in females was  $8.26 \pm 1.81$  months and males were  $8.74 \pm 1.20$  months which was not very statistically significant, however, for upper central incisor (UCI) males showed an earlier age of TE. Infant's BW, HC, Wt, and Lt did not prove to be statistically significant for TE of LCI. Alternatively for UCI, HC and Wt were found to be inversely proportional to the age of TE.

**Conclusion:** In general, the assessment of TE with anthropometric measurements carried out did not show any significant association with an infant's growth and development. However, there is scope for further studies with a larger sample size that can include additional parameters of assessing nutritional status.

**Keywords:** Anthropometric measurements, First deciduous tooth, Head circumference, Height, Tooth emergence, Weight.

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## INTRODUCTION

Human tooth eruption is a genetically determined process of tooth development in which the tooth emerges into the oral cavity. Tooth eruption reflects and is recognized as an important aspect of human growth and development.<sup>1,2</sup> Although teeth eruption is under genetic control, various factors, such as, gender, ethnic-racial-geographic differences, socioeconomic status, craniofacial morphology, body composition, and nutritional indices, have been shown to influence this process of early or delayed tooth eruption.<sup>3,4</sup> The existence of a general connection between dental development and indicators of physical development demonstrates that growth is a unified process even though parts of that process may move at varying speed. Though the explanation of the relationship between deciduous teeth emergence and somatic growth attracted the attention for many decades, the scarce literature on the subject revealed wide variations and contradicting opinions. Certain studies believe that primary teeth emergence is relatively an independent process unrelated to most anthropometric measurements that are used as somatic growth criteria while some studies are presenting significant correlation.<sup>2-6</sup>

The first tooth to appear is the deciduous central incisors in around 6–10 months of age, any deviation from physiologic progress may relate to some underlying pathology. In the present-day scenario, there appears to be some kind of deviation in eruption time of deciduous teeth.<sup>7</sup> Delayed eruption of primary teeth has

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been reported in the Indian population, the first primary tooth to emerge was 8.08 months in boys and 7.88 months for girls.<sup>3</sup> Many studies have shown growth parameters assessed through anthropometric measurements to have an influence on the time

of emergence of deciduous teeth during the first few years of a child's life.<sup>2-4</sup>

Anthropometry is a set of noninvasive quantitative body measurements used to assess growth, development, and health parameters. This includes length (Lt), weight (Wt), and head circumference (HC) which are considered as the determinants of child health. Any abnormality in the growth parameters is indicative of a variety of medical (malnutrition), psychological, or socioeconomic problems.<sup>6</sup>

Indira<sup>8</sup> has mentioned polymorphisms in tooth emergence (TE) that was specific to a population or ethnic group. Other factors like nutritional status and socioeconomic status vary from one geographic region to another that may affect the timing of teeth emergence. Garn<sup>9</sup> in his study written about how American growth standards of tooth eruption could not be applied to developing countries.

Gaur and Kumar<sup>10</sup> assessed the effect of undernutrition on deciduous TE among Rajput children of Shimla District of Himachal Pradesh that have demonstrated the relationship between early childhood malnutrition and eruption of primary teeth,<sup>10,11</sup> however, another study by Elamin and Liversidge found that malnutrition assessed via anthropometric measurements does not affect the timing of human tooth formation.<sup>12</sup> Some studies suggest that primary tooth eruption is related to an infant's weight after birth rather than its weight at birth.<sup>13</sup>

Hence, owing to the sparse literature on the relation of deciduous TE to an infant's growth and development in the south Indian population, the present study was considered. The objective of the study was to associate the influence of an infant's height, Wt, and HC on the age of emergence of the first deciduous tooth.

## MATERIALS AND METHODS

In this descriptive, cross-sectional study, infants aged between 5 months and 12 months, visiting the Department of Paediatric, R.L. Jalappa Hospital and Research Centre, affiliated to SDUAHER Kolar for vaccination were screened. Ethical clearance for the start of the study was obtained by the institutional ethics committee SDUAHER. Only healthy, normal participants brought in for a routine check-up or vaccinations were included in the study sample. Various parameters of interest were estimated with sufficient precision for a period of 6 months and a total of 154 infants participated in this study.

### Inclusion Criteria

Infants:

- Visiting the Department of Paediatric for routine vaccination.
- Age group of 5–12 months.
- With up to 1/3rd of the tooth crown visible in the oral cavity were considered for the study.

### Exclusion Criteria

- Hereditary or congenital diseases.
- Unerupted deciduous tooth or when >1/2 of the tooth is intraorally visible.

After obtaining the parents' consent, infants' parents had to answer predesigned pro forma with details of domicile, socioeconomic details, and birth weight (BW) of the infant. Maternal age, type of delivery, and diet pattern of infants were also recorded.

The infants were subjected to complete medical examination which included general physical examination, vitals, head to toe examination, i.e., cardiovascular, respiratory, per-abdomen and central nervous system examination, and anthropometric measurements by a designated pediatric physician and healthy infants not suffering from any hereditary or congenital diseases were further taken up for intraoral examination at a time by a single examiner to prevent interobserver variations.

Intraoral examination of the central incisor (CI) emergence was performed under aseptic precaution with sufficient light using disposable tongue blades and gloves. The tooth was considered to emerge if any part of the crown had pierced the alveolar mucosa. Only infants with TE were considered for anthropometric measurements. The number of teeth that emerged was counted by the examiner. These infants also had their BW recorded.

Detailed anthropometric measurements (WHO standard):

- Head circumference measured using a non-stretchable tape around the widest possible circumference.
- Length measured using infantometer. From head to heels, up to the nearest millimeter, each infant was measured lying down in a supine position. The infantometer is composed of a horizontal board with an attached metric ruler and a vertical immovable headboard that could contact the uppermost part of the head and a movable footboard at its end to contact the heels. The crown of the infant's head touched the immovable vertical headboard. The head was held with the line of vision aligned perpendicular to the plane of the measuring surface. The shoulders and buttocks were flat against the tabletop. The legs were placed flat against the tabletop with the toes pointing upwards and the movable footboard was placed against the heels. As for older children they were weighed standing up, shoulders relaxed and the back straight and erect. The hands and arms were kept relaxed with palms facing medially.
- Body weight measurements were recorded with minimum clothing on a sensitive electronic weighing device lying down or sitting on a leveled pan scale. The infant was placed on the scale so that the Wt was distributed equally to the center of the pan.

Statistical analysis was carried out using descriptive statistics that included the mean and standard deviation for each group calculated. Tables were used for descriptive analysis of the presented data and comparison with cross-tabulation and frequencies. The student's *t*-test was used to compare the difference between groups to conclude statistical significance which was set at  $p \leq 0.05$ .

## RESULTS

A cross-sectional observational study that comprised a total of 154 infants were subjected for examination. Of the 154 cases examined, 52.6% were female and 47.4% were male. Tooth emergence age ranged from 6 to 12 months. The highest recorded (38.27%) age of TE ranged between 6 and 7 months in females followed by 35.61% for the age group of 8.1 and 9 months in males (Table 1). One hundred and one of the infants were delivered through cesarean section when compared to 53 patients who underwent normal deliveries.

The first tooth to emerge into the oral cavity was the lower central incisor (LCI) (81.9%) compared to the upper central incisor (UCI). With 22.1% of infants showed polymorphism in the form of UCI to erupt first than LCI and 6% of left LCI was found to erupt earlier compared with right LCI (Table 2).

Females showed earlier LCI TE with a mean age of  $8.26 \pm 1.81$  months compared with male babies  $8.74 \pm 1.20$  months which was not statistically very significant difference, however, for UCI males showed an earlier age of TE compared with that of females (Table 3).

74.02% of infants screened were above 2.5 kg with an average age of TE was 8.1 months while an average of 25.97% of cases was of low BW category where TE was 9 months. Tooth emergence was

seen from 6 months of age irrespective of BW and the age of TE did not correlate with BW (Table 4).

Tooth emergence in infants with microcephaly was found to be 7 and 8.7 months in females and males, respectively. While in normal growth, the TE was seen at 8.6 to 9.3 months. Infants above the 95th percentile showed emergence time within 7 to 7.5 months (Table 5).

Tooth emergence time with undernourishment was found to be range from 7 to 11 months with a mean age of 9.5 months while TE in normal weight was seen to range between 7 and 10 months with a mean age of 8.7 months and the well-nourished mean age was 8.2 months (Table 6). All the infants had started on a supplementary diet as they had completed 6 months but detailed information on pattern or type of diet could not be collected.

When Lt was used as a parameter, infants categorized with small-statured (<3%) TE was found to range from 7 to 11 months with a mean age of 8.8 months. In normal stature, the mean TE was 8.9 months and that of well-built infants 8.1 months as mean age of TE was found (Table 7).

**Table 1:** Distribution of the subjects based on tooth emergence

TE (in months)	Frequency		Percentage	
	Male	Female	Male	Female
6-7	10	31	13.69	38.27
7.1-8	24	23	32.87	28.39
8.1-9	26	10	35.61	12.34
9.1-10	5	0	6.84	00
10.1-11	3	10	4.10	12.34
11.1-12	5	7	6.84	8.64
Total	73	81	47.40	52.59

**Table 2:** Distribution of the subjects based on the first tooth to the emergence

First TE	Frequency	Percentage
LCI	126	81.9
UCI	28	18.2
Total	154	100.0

## DISCUSSION

Studies have shown variation in emergence time of the first deciduous tooth among infants of the present generation. Tooth emergence is considered an important milestone of a child's growth and development, which could provide valuable information to the clinician. A delayed eruption of the tooth is often the cause of apprehension among parents which leads to unnecessary exposure to radiation. These concerns can be addressed when the TE profile

**Table 3:** Mean age (in months) distribution of the subjects during the first tooth emergence

Gender	Tooth	N	Min	Max	Mean	Std. dev.
Male	LA	62	6	11.5	8.74	1.20
	UA	11	7	11	7.36	1.14
Female	LA	64	6	12	8.26	1.81
	UA	17	7	11	8.17	1.82

**Table 4:** Distribution of cases according to birth weight and age

Birth weight	Age (in months)					Total
	6.1-7 months	7.1-8 months	8.1-9 months	10.1-11 months	11.1-12 months	
<2.5 kg	15	05	09	05	06	40 (25.97%)
>2.5 kg	16	38	46	09	05	114 (74.02%)
Total	31	43	55	14	11	154

**Table 5:** Cross-tabulation of the head circumference with gender and tooth emergence

HC	Average TE age female		Average TE age male		Mean age
	LA	UA	LA	UA	
<3%	7.0	0	8.7	11.0	8.9
≥3 to <50%	8.6	9	9.3	0	8.9
≥50 to 95%	7.0	0	0	7.5	7.2

**Table 6:** Cross-tabulation of weight with gender and tooth emergence

Weight	Average TE age female		Average TE age male		Mean age
	LA	UA	LA	UA	
<3%	7.0	11.0	9.3	11.0	9.5
≥3 to <50%	10.0	9.0	8.8	7.0	8.7
≥50 to 95%	7.5	0	9.0	00	8.2

**Table 7:** Cross-tabulation of length with gender and tooth emergence

Length	Average TE age female		Average TE age male		Mean age
	LA	UA	LA	UA	
<3%	7.5	11.0	10.0	7.0	8.8
≥3 to <50%	8.7	7.0	9.1	11.0	8.9
≥50 to 95%	8.5	7.0	8.8	00	8.1

is studied for a specific population based on geographic location, socioeconomic status, race, and other factors that influence tooth eruption.

The present study assessed the emergence profile of the first deciduous tooth of infants between the age group of 5 and 12 months, which is considered as the most appropriate age for the CI eruption. Babies who visited the hospital for immunization with the presence of 1/3rd of the visible first deciduous tooth were considered as they closely coincide with the emergence time of the tooth. All the infants belonging to the same socioeconomic group were considered, similar to a study by Kohli et al.,<sup>2</sup> to eliminate the effects of socioeconomic status on the eruption.

Head circumference, Wt, and Lt were compared with TE by categorizing babies based on percentile growth chart as <3%, 3 to 50%, and above 50%. It was found that the LCI age of TE occurred irrespective of microcephaly or normal HC. However, with respect to UCI infants with microcephaly took a long time to erupt when compared with normal HC.

In the case of Wt, the age of TE of LCI was found to be unaffected. However, for UCI, there was an association, i.e., age of TE was inversely proportional to body weight in both the sexes. Alternately, infants for UCI with less than 3rd percentile took a long time for the emergence of the tooth when compared to those who were above the 50th percentile. Many studies revealed a correlation of infant weight with the age of TE which shows overweight babies to have faster TE when compared to the ones with underweight.<sup>5</sup>

Certain studies have shown a strong association between Lt with the age of TE where growth spurts are fastest tend to also influence TE especially during the first 24 months of age.<sup>4</sup> However, other studies<sup>3,4</sup> did not find an association between infants' length and TE age. Similarly, in the present study, there was no effect of Lt on upper and lower incisor emergence.

In the present study, the average age of TE was found to be 8.50 months for LCI while for UCI 7.76 months which is in accordance with the eruption chronology of Law and Lunt (1974).<sup>4</sup> Hence, eruption time in the present study could not be related to the nutritional status of the infants. This was similar to a study by Elamin and Liversidge<sup>12</sup> where growth parameters did not affect tooth eruption.

Tooth emergence in females was found to occur at an earlier age when compared with males, which was not very statistically significant unlike a study by Un Lam et al.<sup>14</sup> among infants of Singapore popularly known as Gusto (growing up in Singapore towards healthy outcome) cohort study that associated eruption time with growth and metabolic function. Demirjian and Levesque<sup>15</sup> have found a similarity between boys and girls in the early stages of development and the advancement of females over males in later stages. Few authors report significant earlier eruption in males compared to females<sup>16</sup> while Magnusson<sup>17</sup> reported significant earlier eruption in females.

About 80% of the participants in the present population showed LCI as the 1st tooth to emerge into the oral cavity while <20% chances of UCI to emerge as 1st deciduous tooth.

Among the LCI to erupt left side of the LCI had 6% chances of erupting earlier when compared to the right LCI, however, this sequence of TE does not seem to present a problem in the primary dentition.

Birth weight has been considered as a contributing factor with regards to the time of TE in certain studies.<sup>18</sup> A recent cross-sectional study analyzed the association between LBW and delay in the eruption of deciduous teeth among 520 children of 04 to 30 months living in Salvador, Bahia has found a positive association.<sup>19</sup>

While some studies<sup>18,20</sup> contradict the association between BW and TE, similarly Andrade and Bezerra<sup>21</sup> in 1998 did not find any delay in the chronology of eruption of deciduous teeth in high-risk infants (born underweight <2,500 g, premature <37 weeks, born with respiratory problems or hypoglycemia, or with other problems). However, they attributed this circumstance to the fact that they did not study very low BW babies. They studied the only low BW and normal BW that did not show any difference in eruption, which is similar to the present study. Tooth emergence as early as 6 months was seen both in BW <2.5 and >2.5 kg.

**Limitation and Future Directions**

Age distribution of infants in the present study was not found to be evenly distributed which might affect statistical interpretation. A larger sample size along with additional parameters of nutrition could prove effective in correlating TE with growth parameters. The sequence of birth time of the infant and the interval between births of siblings was not recorded. Maternal screening for fluorosis could not be carried out because of time restraints in the present study, as Kolar being an endemic of fluorosis can prove to be an occult factor that needs to be reflected upon in further studies.

**CONCLUSION**

In the present population, females had an earlier age of TE when compared with males in the case of LCI whereas UCI males had an earlier emergence pattern. The frequency of TE is higher for LCI compared to that of UCI. It was found that Wt and HC had influence only on UCI age of emergence while TE was found to be unaffected with respect to Lt. Very low birth weight (VLBW) babies were not considered, mother's nutritional supplements, as well as infant's type of feeding habits, need to be dwelt upon which can be the future scope for study.

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