# Factors Associated With Number of Erupted Primary Teeth in Brazilian Children: A Cross-sectional Study

*Patrícia Corrêa-Faria, DDS, MS* *Letícia Leite-Faria, DDS*
*Aline Neves Viana, DDS* *Leandro Silva Marques, DDS, MS, PhD*
*Fernanda Oliveira Ferreira, DDS, MS, PhD*
*Maria Letícia Ramos-Jorge, DDS, MS, PhD*

## ABSTRACT

**Purpose:** The purpose of this study was to determine whether nutritional status, gender, weight, and height affected the number of erupted primary teeth in six- to 30-month-old children.

**Methods:** A cross-sectional study was carried out involving an oral clinical examination, and weight and height measurements of 232 children, as well as a questionnaire filled out by their parents. Statistical analysis involved descriptive data, Spearman's correlation coefficient, Kruskall-Wallis test, and multiple linear regression in two sets, using the enter method to control the confounding factor (age) and the stepwise method for gender, weight, and height ($P<.05$). The calculation of effect size proposed by Cohen was used to test the clinical significance of the findings.

**Results:** The number of erupted teeth was not significantly influenced by nutritional status ($P<.58$; Kruskal-Wallis test) or gender ($P=.95$; Mann-Whitney test). Body weight had a statistically significant association with the number of erupted primary teeth ($P<.001$), and height showed a positive correlation with this variable, both independently of the child's age.

**Conclusion:** The number of erupted primary teeth was affected by weight in children of the same age. (J Dent Child 2013;80(3):111-4)

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The number of erupted primary teeth provides complementary information in the assessment of a child's growth and development, especially when used in conjunction with weight and height.[1] The number of erupted teeth is related to age, but a series of factors in the eruption process can alter this number.[2] Variations in the number of erupted teeth may be associated with gender,[3-6] nutritional status,[7,8] weight and height.[1,2] Studies report differences between boys and girls in the number of erupted teeth,[3,4] with tooth eruption beginning earlier in boys.[9] Other authors, however, report that there may not be a difference between genders.[2] Moreover, nutritional deficiencies can lead to delays in the tooth eruption process.[8,10]

As the number of erupted primary teeth is an important factor in the assessment of child development, it is crucial to understand the normal pattern of eruption in order to identify factors that lead to alterations in this pattern.[1] Studies have shown that the eruption of primary teeth is influenced by somatic measures.[1-5] When doing such studies, one must control for variables (such as age) to determine the actual association between tooth eruption and characteristics

*Dr. Corrêa-Faria is a pediatric dentist in private practice and researcher, Drs. Marques and Ferreira are associate professors, and Dr. Ramos-Jorge is a professor, all in the Department of Dentistry, School of Dentistry, Federal University of Vales do Jequitinhonha e Mucuri; Drs. Leite-Faria and Viana are dentists in private practice, all in Diamantina, Minas Gerais, Brazil.*

*Correspond with Dr. Corrêa-Faria at patriciafaria.faria09@gmail.com*

of the child. Moreover, considering common risk factors from the standpoint of public health, the identification of factors that affect tooth eruption may allow the diagnosis of health problems in children.

The purpose of the present study is to determine whether nutritional status, gender, weight, and height are associated with the number of erupted primary teeth after controlling for age.

## METHODS

This cross-sectional study received approval from the Human Research Ethics Committee of the Federal University of Vales do Jequitinhonha e Mucuri, Diamantina, Minas Gerais, Brazil.

The study population included healthy children between six and 30 months of age, treated at the 10 basic health care clinics in the city of Diamantina, Brazil, during immunization campaigns held in 2010 and 2011. Children who did not cooperate during the exam and those with systemic problems that compromise normal growth and development, such as endocrine issues and syndromes affecting the chronology of tooth eruption (e.g., Down syndrome, Turner's syndrome, and cleidocranial dysplasia), were excluded. Parents signed an informed consent to participate in the study.

Data acquisition involved an oral clinical exam and anthropometric measures (weight and height). Information about the child (age, gender, health history) was obtained from the parents. Each health care clinic had one team made up of three dentists or dental students (one examiner and two assistants). The information obtained was recorded in forms made up specifically for the project. To count the number of erupted teeth, the child lay on the guardian's lap during the examination, facing the examiner and a window in order to maximize the use of natural light. Disposable tongue depressors and gauze were used. A tooth whose crown was visible in the oral cavity was considered erupted.[11]

Anthropometric measures were used for the assessment of nutritional status. Children younger than 24 months old were weighed on a pediatric scale and measured in the supine position. Children older than 24 months old were weighed on a digital scale (Plenna, São Paulo, Brazil). The scales were calibrated using an object of known weight. Height was determined on a 2-meter long stadiometer on a flat surface with a millimeter scale (Welmy, Porto Alegre, Brazil). The investigators who measured height underwent a training process prior to and during the data collection. Height and weight were taken on two separate occasions during the calibration, with a 15-day interval between readings for the determination of intraexaminer and interexaminer reliability using the intraclass correlation coefficient (ICC). The value of ICC was 0.86. As the ICC coefficient was excellent, the examiners were considered able to perform the epidemiological study.

Nutritional status was determined by using reference standards stipulated by the American National Center for Health Statistics,[12] based on the following weight/age ratio: underweight for age (percentile <3), nutritional risk (between percentiles 3 and 10), ideal or adequate (between percentiles 10 and 97) and overweight (percentile >97).

Prior to the fieldwork, a pilot study was conducted with a sample of 30 children, who were visited at their homes to test the instruments and data collection method. This pilot study revealed that the questionnaire was well understood by the parents and the method for the clinical exam was adequate.

Data analysis was performed using Statistical Package for Social Sciences 17.0 software (SPSS Inc, Chicago, Ill.) and included frequency distribution, Spearman's correlation coefficient, Kruskall-Wallis test, Mann-Whitney test, and multiple linear regression in two sets, using the enter method to control for the confounding factor (age) and the stepwise method for gender, weight and height ($P<.05$). To test the clinical significance of the findings, the calculation of effect size proposed by Cohen[13] was used to compare the two proportions (chi-square test), correlations, and analysis of variance (**ANOVA**). According to Cohen's criteria, effect size statistics of 0.1 to <0.3 indicate a small, clinically meaningful magnitude of difference; effect size statistics of 0.3 to <0.5 indicate a moderate difference; and effect size statistics ≥0.5 indicate a large difference in the results of the chi-square test and correlation analysis. The effect size was checked by Cohen's d. In correlation analyses, the correlation coefficient (r) provides an estimate of the intensity of the association between variables. With ANOVA, effect size statistics of 0.1 to <0.25 indicate a small difference, effect size statistics of 0.25 to <0.4 indicate a moderate difference, and effect size statistics ≥0.4 indicate a large difference.

## RESULTS

Two hundred thirty-two children (mean age=18.78± 6.95 months) participated (Table 1). One hundred

**Table 1. Distribution of children according to gender and age***

| Age (mos) | Gender | | Total |
|---|---|---|---|
| | Male n (%) | Female n (%) | |
| 6-12 | 28 (50) | 28 (50) | **56** |
| 13-18 | 19 (41) | 27 (59) | **46** |
| 19-24 | 49 (62) | 30 (38) | **79** |
| 25-30 | 26 (51) | 25 (49) | **51** |
| **Total** | | | **232** |

** Chi-square linear trend test (P=.59; Cohen's d=.15).*

twenty-two (53%) were boys. The mean number of erupted teeth was 11.55±6.67. No statistically significant difference was found between gender and age ($P$<.15).

Regarding nutritional status, 73% of the children were within the normal range, 10% were classified as oveweight/obese, 11% were at nutritional risk, and 6% were either underweight or very underweight. The number of erupted teeth was not significantly affected by nutritional status (Table 2). No statistically significant association was found between the number of erupted teeth and gender ($P$=.95). The number of erupted teeth was positively correlated with weight ($P$<.001) and height ($P$<.001; Table 3).

In the adjusted multivariate regression model, age ($P$<.001) and weight ($P$=.009) remained associated with the number of erupted primary teeth, whereas height ($P$=.09) and gender ($P$=.50) were excluded from the analysis. The beta values provided by the regression analysis indicate that a 1-gram increase in weight was associated with an eruption increase of 0.09 teeth. Hence, an increase of 11.11 g was related to an increase of one erupted tooth among children of the same age (Table 4).

As age was a confounding variable regarding the eruption of primary teeth, the statistical analysis was performed controlling for this variable. Therefore, comparisons between children in the same age group were performed.

## DISCUSSION

The present study tested associations between the number of erupted primary teeth and nutritional status, gender, and anthropometric measures while controlling for age. The effect size of the analysis was also assessed, with a small effect size indicating a small degree of clinical significance for the finding. No significant difference and a small effect size were found between gender and the number of erupted teeth, which corroborates findings reported in previous studies.[2-14] Moreover, the number of erupted primary teeth was not significantly influenced by nutritional status, which also demonstrated a small effect size. By contrast, Holman and Yamaguchi[8] found that children with nutritional deficiencies exhibited delays in the eruption of primary teeth compared to well-nourished children. Bastos et al.[5] reported a similar result in a study in which children with malnutrition up to 6 months of age exhibited delays in tooth eruption. However, those studies were longitudinal, thus caution should be exercised when comparing their results with ours.

Weight and height are directly related to child growth and development, with the number of erupted primary teeth being highly influenced by height, which was corroborated by the present study.[1,2] This association, however, did not occur independently of age. In turn, weight proved to be an explanatory variable for the number of erupted teeth in the present study independently of the child's age, which contrasts with findings reported in a previous study.[2]

As this was a cross-sectional study, caution must be exercised in the generalization of the results, because the study design only allows for the establishment of associations between variables and no cause-and-effect conclusions can be drawn. Longitudinal studies, therefore, are needed for the assessment of primary tooth eruption and anthropometric measures. Another important aspect that should be addressed is differences in study methodologies, as most studies assess the chronology of the eruption of primary teeth rather than the number of erupted teeth, which hinders comparisons with the present results.

The associations between the number of erupted primary teeth and weight found in the present study suggest that the oral examination can be used as a supplement in routine pediatric exam, assisting in the evaluation of child growth and development.

## CONCLUSION

Based on the results of this study, it can be concluded that the number of erupted primary teeth is affected by weight in children of the same age.

**Table 2. Number of erupted primary teeth according to nutritional status**

| Nutritional status | No. of erupted primary teeth | | $P$-value* | Cohen's d† |
|---|---|---|---|---|
| | Mean±(SD) | Median | | |
| Ideal | 11.5±7.0 | 13.0 | <.58 | .01 |
| Overweight/obesity | 9.7±5.9 | 9.0 | | |
| Nutritional risk | 12.4±6.3 | 13.0 | | |
| Low/very low weight | 12.5±4.6 | 15.0 | | |

** Kruskal–Wallis test.* *† Small effect size.*

**Table 3. Correlation between number of erupted primary teeth and weight and height; (N=232)**

| | Spearman's correlation coefficient (r)* | $P$-value |
|---|---|---|
| Weight | 0.61 | <.001 |
| Height | 0.78 | <.001 |

** Large effect size.*

**Table 4. Multiple linear regression (enter and stepwise methods) for age, weight, number and of erupted primary teeth**

| Variable | Beta | 95% confidence interval | $P$-value* |
|---|---|---|---|
| Age (mos) | 0.83 | 0.72-0.86 | <.001 |
| Weight (g) | 0.10 | 0.07-0.49 | .009 |

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