

Timing of Primary Tooth Emergence among U.S. Racial and Ethnic Groups

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Abstract:

Objectives: To compare timing of tooth emergence among groups of American Indian (AI), Black and White children in the U.S. at 12 months of age.

Methods: Data were from two sources – a longitudinal study of a Northern Plains tribal community and a study with sites in Indiana, Iowa and North Carolina. For the Northern Plains study, all children (n=223) were American Indian, while for the multi-site study, children (n=320) were from diverse racial groups. Analyses were limited to data from examinations conducted within 30 days of the child's first birthday.

Results: AI children had significantly more teeth present (Mean: 7.8, Median: 8.0) than did Whites (4.4, 4.0, $p < 0.001$) or Blacks (4.5, 4.0, $p < 0.001$). No significant differences were detected between Black and White children ($p = 0.58$). There was no significant sex difference overall or within any of the racial groups.

Conclusions: Tooth emergence occurs at a younger age for AI children than it does for contemporary White or Black children in the U.S.

Key Words: tooth emergence, tooth eruption, children, dental caries, health disparities

Introduction

Recent studies have [reported](#) that American Indian and Alaska Native (AI/AN) children have significantly higher prevalence of early childhood caries (ECC) than other groups (1-3). For example, when compared with national data from NHANES (3), data from a recent survey by the Indian Health Service districts (1) [reported](#) that caries prevalence among 2-5 year old AI/AN children was [62%, which was substantially higher](#) than that of Whites([19%](#)), Blacks ([28%](#)) or Mexican-Americans ([33%](#)) in the U.S. Moreover, the mean [number of decayed or filled teeth \(dft\)](#) was much higher for AI/AN children ([4.1](#)) [than for children in the general population \(1.2\)](#), so that the severity of the disease was also much greater([1,3](#)). The reasons for the high prevalence and severity aren't completely clear, but factors such as lower socio-economic status, lower parental education, and poor dietary practices have been implicated (4-5). In addition, poor oral hygiene and early colonization by cariogenic organisms have also been identified as possible risk factors (4-6).

Another factor which has been suggested as contributing to [caries](#) in AI children is early [emergence](#) of the dentition ([7,8](#)). There is little published data regarding [the timing of](#) primary tooth [emergence](#) in the AI population, particularly relative to other population groups, but at least one study from the 1940s suggested earlier [emergence](#) of [permanent](#) teeth in AI children ([8](#)). [In this study, the mean age of emergence of the different tooth types were compared among Navajo, Black, White/European and Central American aboriginal children, and the results were that the Navajo children had earlier tooth emergence than the other groups \(8\)](#)

It is hypothesized that colonization by cariogenic bacteria may occur earlier in AI children, which is facilitated by earlier [emergence](#) of [the](#) primary teeth (6). Challenges in performing oral hygiene for younger infants and dietary characteristics could also contribute to a possible association between early [emergence](#) and early colonization. However, as stated previously, there has been little study of [tooth](#)

emergence in AI children and virtually no studies have compared timing of emergence among different racial/ethnic groups in the primary dentition. Therefore, the purpose of this study was to compare tooth timing of primary tooth emergence among groups of AI, White and Black children in the U.S. at 12 months of age.

Methods

This study utilized data from two longitudinal studies of early childhood caries. The first was a cohort study of Northern Plains AI children followed from birth to age 3, while the second was a study of ECC risk prediction in children from age 1 to age 4, with study sites in Indiana, Iowa and North Carolina. The methods for each study are described separately below.

Northern Plains American Indian Study (Study 1). For this study, a cohort (n=239) of mother-child dyads was recruited during the children's first month of life in 2009-2010. All children in this study were American Indian or mixed-race American Indian. Study methods have been described previously (2,6), but in brief, data were obtained at baseline and when the children reached the ages of 4 months, 8 months, 12 months, 16 months, 22 months, 28 months and 36 months. Data were collected via questionnaire and clinical examinations of the children at these ages. Questionnaire data included detailed dietary and oral hygiene behaviors data, family and demographic characteristics, and plaque samples from both children and mothers (or other caregivers). Examinations for caries were conducted by dental hygienists trained to criteria adapted from those used in NHANES and other studies. In addition to the examinations of children, mothers also received an examination for caries at baseline, but none of the other time points.

For these analyses, only the data from the age 12 month examinations (± 30 days) were included (n=223), and individual teeth were considered present if any part of the tooth was clearly visible in the mouth.

Study of Early Childhood Caries Risk (Study 2). For the second study, 1,326 children and mothers were recruited into the study beginning when the children were 6 months of age, with initial examination of the children conducted when they were 12 months (± 3 months) of age in 2012-2014. Subsequent examinations took place when children were 30 months of age, and are planned for 48 months. For these analyses, data were restricted to only those examined ± 30 days of their first birthday (n=320) in order to be comparable to the age range of Study 1.

Examinations for caries were conducted by trained dentists and dental hygienists at each of the three sites (Indianapolis, Iowa City, Durham) using the International Caries Detection & Assessment System (ICDAS). For these examinations, anterior teeth were considered present if an estimated 50% of the crown was visible; posterior teeth were considered present if all of the occlusal table was visible. Children in this study were primarily White (Caucasian) or Black (African-American), and for these analyses, only children whose parents identified their children as a member of one of these groups were included.

Data Analyses. For these analyses, all data were entered and verified and converted into SAS for analyses, with the main focus being a comparison of the racial groups – American Indian children in Study 1, and White and Black children from Study 2 – on the number of teeth present at 12 months (± 30 days). Wilcoxon-rank-sum tests were used to compare median values among the three racial groups and pairwise by sex, with $p < 0.05$ considered statistically significant.

Results

As presented in Table 1, American Indian children had significantly ($p < 0.001$) more teeth (mean=7.8) present than did Whites (mean=4.4) or Blacks (mean=4.5) at 12 months of age, while there was no significant difference in the median number of teeth present between Whites and Blacks ($p = 0.58$). In addition, the median age of children did not differ significantly among groups, although American Indian children were slightly younger on average than the other groups.

Table 2 presents a comparison of the groups stratified by sex. Although males had more teeth present than females in all groups, the differences weren't significant for any group.

Discussion

The results of this comparison of the number of teeth present at 12 months of age among three racial groups suggest that American Indian children have much earlier emergence of the primary dentition than do Whites or Blacks in the U.S. While a few articles in the literature have reported somewhat anecdotal reports of early tooth emergence in American Indians (7,8), this study is the first recent study to compare the timing of tooth emergence across racial/ethnic groups concurrently (i.e., not comparing to historical data). As such, the study provides evidence that teeth emerge at an earlier age in American Indian children than in other groups, so that the hypothesis that early tooth eruption contributes to higher caries rates in this population is plausible.

As stated previously, earlier emergence of the primary teeth could allow for earlier colonization of cariogenic bacteria, which would allow more time for caries to develop. The early emergence of teeth, combined with high rates of poverty and its associated factors – diets high in sugar and processed foods, lack of emphasis on oral hygiene, mother, family and caregiver stresses and lack of oral health care – could partially explain the extremely high rates of early childhood caries among young AI children (1,2). More study of how early tooth emergence and other factors contribute to caries in this population is needed, including analyses planned for Study 1 data concerning many of these factors.

It is plausible that early emergence contributes to ECC, but it is less clear why it appears to occur earlier in American Indian children. While racial differences in the timing of tooth emergence have been reported (, 7,8), there is a dearth of information in the literature as to why racial differences occur. Some studies have suggested that perinatal nutrition or pre-term birth may influence tooth development, but with somewhat conflicting results. One such study (9) suggested that higher birth weight was associated with earlier emergence, but that malnutrition had little effect (9), while others suggested that prematurity, low birthweight and malnutrition were strongly associated with delayed emergence (10,11), Genetic influences have also been suggested to be an important determinant of the timing of tooth emergence, with heritability accounting for as much as 96% of the variation in one study(12). However, if the relative contribution of genetic and environmental factors, such as nutrition or pre-natal health, to the timing of tooth emergence is not clear, and thus, the reasons for the large differences in the number of teeth present between American Indian children and others found in the present study are speculative.

While these analyses provide evidence that tooth emergence occurs earlier in American Indian children than in other groups in the U.S., interpretation of the study's results requires some caution. Neither of the studies utilized a representative sample, so that the results cannot be generalized to larger populations. Moreover, the study of AI children included only one tribal community; other AI children may not exhibit early tooth emergence to the same extent. In addition, both studies were designed to assess caries and were not specifically focused on tooth emergence. Finally, the two studies had slightly different definitions of when a tooth was considered to be present, and this difference in definitions could have accounted for some of the differences between groups.

In conclusion, while the results must be interpreted with caution, the magnitude of difference in the timing of tooth emergence between American Indian and other children found in this study, ,

strongly suggests that primary tooth emergence does occur earlier in American Indian children, which could possibly contribute to high levels of caries in this population.

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Table 1 – Comparison of Number of Teeth Present and Age Characteristics among the 3 Racial Groups

	Study 1: American Indian (n=223)†	Study 2: White (n=184)	Study 2: Black (n=136)
Mean Number of Teeth (S.D.)	7.8 (2.6)	4.4 (3.0)	4.5 (2.6)
<u>Minimum Number of Teeth</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>25th Percentile – Number of Teeth</u>	<u>7</u>	<u>2</u>	<u>2</u>
Median Number of Teeth†	8	4	4
<u>75th Percentile – Number of Teeth</u>	<u>8</u>	<u>6</u>	<u>7</u>
<u>Maximum Number of Teeth</u>	<u>20</u>	<u>16</u>	<u>11</u>
Mean Age (months)	11.2	11.6	11.6
Median Age (months)	11.0	12.0	12.0

† American Indian children had significantly ($p < 0.001$) more teeth present than did Whites or Blacks, based on the Wilcoxon Rank Sum test

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Table 2 – Mean and Median Number of Teeth Present by Sex and Racial Group

	Mean Number of Teeth Present	Median Number of Teeth Present	p-value†
Study 1: American Indian			0.69
Males (n=99)	8.0	8.0	
Females (n=124)	7.7	8.0	
Study 2: White			0.06
Males (n=101)	4.7	4.0	
Females (n=83)	4.1	4.0	
Study 2: Black			0.15
Males (n=73)	4.8	5.0	
Females (n=63)	4.2	4.0	

† p-value based on Wilcoxon Rank Sum test of the null hypothesis that the distribution of the number of teeth present was the same in males and females within each specified racial group

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