

Oral anomalies in the neonate, by race and gender, in an urban setting

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Abstract

A broad range of developmental anomalies and morphologic variants may occur in the oral cavity of the newborn. Because many of these are transient (e.g.: palatal and alveolar cysts, lymphangioma), self-correcting with age, conventional assessments of older children can yield significantly altered trait incidences. A total of 500 normal full-term newborns (blacks and whites) were assessed by standardized criteria for 11 oral conditions, in addition to collating data on maternal conditions (age, gravidity, tobacco and alcohol use). Leukoedema and median alveolar notches were significantly more common in blacks, whereas palatal cysts were 2.5 times as likely to occur in whites. Ankyloglossia, three times as common in males, was the one trait to exhibit a significant predilection by gender. Low maternal age (< 20 years) significantly enhanced the risk of alveolar lymphangioma in these data.

Introduction

A variety of minor anomalies may occur in the oral cavity of the newborn. Collectively these conditions (e.g.: cysts, lymphangioma, leukoedema) are common, but most are innocuous and resolve with age in the absence of treatment. Because of the ephemeral nature of some traits, assessments of older children and of adults typically underestimate the frequency of minor anomalies in infancy.

Based on standardized assessments of a large sample of newborns, we report here on the incidences, by gender and race (black, white), of a series of minor oral anomalies in phenotypically normal full-term neonates. Knowledge of the baseline frequencies of these traits provides a more exact assessment of the likelihood and prognosis of spontaneous involution of a condition in a given patient.

Based on previous research in neonates, we expected to find a substantial incidence of midpalatal and alveolar cysts (Nichamin and Kaufman 1963; Fromm 1967; Cataldo and Berkman 1968; Jorgenson et al. 1982),

median alveolar notch (Rao 1979; Jorgenson et al. 1982), and leukoedema (Martin and Crump 1972; Jorgenson et al. 1982; Durocher et al. 1972; Shafer et al. 1983). Commissural lip pits (Everett and Wescott 1964; Baker 1966; Jorgenson et al. 1982), ankyloglossia (McEnery and Gaines 1942; Mathewson et al. 1966), natal teeth (Masler and Savara 1950; Anderson 1982; Kates et al. 1984; Leung 1986), and congenital epulis (Custer and Fust 1952; Bhaskar and Akanum 1955; Fuhr and Krogh 1972; Welbury 1980) occur infrequently. Alveolar lymphangioma is a rare lesion which has been found only in black infants (Levin et al. 1976; Kettle and Weaver 1987).

Materials and Methods

The sample consisted of 500 neonates from well baby nurseries at the Regional Medical Center, Memphis, Tennessee. The majority of mothers were economically disadvantaged and resided in contiguous urban areas. It merits emphasizing that none of the infants was admitted to the intensive care unit; all were full-term. Each infant was scored by the same two authors (GWF, TLF). In addition to a spectrum of maternal characteristics, each case was scrutinized for the occurrence and, where relevant, the location, severity and/or number of each anomaly (Table 1, next page). Grading criteria adhered to the trait descriptions of Jorgenson et al. (1982) and Shafer, Hine and Levy (1983). Also, to correlate clinical and microscopic observations, a series of stillborns (N = 27) was examined prior to this study. The lesions were biopsied, and histologic slides of the conditions were scrutinized.

Race and gender differences were tested for each trait from partitions of three-way contingency tables (race-x-gender-x-anomaly) using the BMDP statistical package (Dixon 1981). The log-likelihood test (G) was computed as the test statistic (Sokal and Rohlf 1981). Odds ratios (OR) were calculated as estimates of the enhanced risk of trait occurrence in specific groups (Rosner 1986).

Most traits naturally present as dichotomous (absent-present) entities. Following exploratory analysis, we also categorized the continuous variables (e.g.: gravidity, birthweight) into intervals based on the sample distribution using cutpoints that provided tests meeting minimum criteria for expected cell sizes (Fisher 1954). This permitted uniform statistical analysis across all traits (Tables 2 and 3). Analysis was, however, extended as far as possible to assess trait gradations (Table 1), such as number of palatal cysts and location of alveolar cysts, to further distinguish between race and gender predictions.

TABLE 1. Criteria for Partitioning Trait Grades and the Corresponding Trait Incidences for the Total Sample of Newborns

Condition	Categorization	Sample Incidence (%)
Location	0. City	87.2
	1. Rural	12.8
Maternal age	<20 yrs	36.6
	20-25 yrs	31.4
	>25 yrs	32.0
Gravidity	1	29.2
	2	28.6
	≥3	42.2
	Parity	0
Parity	1	26.2
	≥2	32.4
	Number term offspring	0
Number term offspring	1	25.6
	≥2	30.0
Number pre-term offspring	0	93.0
	≥1	7.0
Number of abortions	0	75.2
	≥1	24.0
Number of living offspring	0	39.6
	1	28.8
	≥2	31.6
Tobacco	0. nonsmoker	77.2
	1. smoker	22.8
Alcohol	0. non-use	93.6
	1. use	6.4
Birth weight	<2750 gms	22.8
	2750-3450 gms	51.0
	>3450 gms	26.2
Crown-heel length	<49 cms	31.2
	49-52 cms	44.0
	>52 cms	24.8
Lip pits	0. absent	90.8
	1. unilateral	1.2
	2. bilateral	8.0

continued

Results

Some traits, notably congenital epulis (Welbury 1980), were not found in this series by virtue of their rarity (Table 1). A single natal tooth was observed (1/500, 0.2%); this was the very early eruption of the mandibular right central incisor in a black male.

Sample Demographics

Mothers of the offspring were characterized as follows (Tables 1 and 2): They are young, with one-third less than 20 and two-thirds less than 25 years of age. They are black (82%) and reside in a metropolitan urban setting; whites in this series were three times as likely to live in outlying farming communities. Almost one-third of the women (29%) were primiparous, though another third had a history of at least one abortion by anamnestic

Condition	Categorization	Sample Incidence (%)
Leukoedema	0. absent	64.8
	1. mild	11.2
	2. moderate	17.0
	3. severe	7.0
Median alveolar notch	0. absent	78.8
	1. mild	7.8
	2. moderate	7.6
	3. marked	5.8
Palatal cysts (location)	0. absent	41.8
	1. hard/soft palate	45.8
	2. mid palatal raphe	12.4
Palatal cysts (number)	0	41.8
	1-2	34.4
	≥3	23.8
Alveolar cysts (location)	0. absent	75.0
	1. facial	13.8
	2. ridge	8.8
	3. lingual	1.0
	4. bilateral	1.4
Alveolar cysts (number)	0	75.0
	1-2	16.2
	≥3	8.8
Alveolar lymphangioma	0. absent	98.2
	1. present	1.8
Natal teeth	0. absent	99.8
	1. present	0.2
Congenital epulis	0. absent	100.0
	1. present	0.0
Ankyloglossia	0. absent	95.6
	1. present	4.4

history. Of this latter group, the white subset was twice as likely (OR = 2.2) to have had one or more abortions (spontaneous and therapeutic combined). Conversely, the black series had significantly more offspring (parity ranged from 0 to 14). White mothers were more likely to smoke (OR = 3.1), but there was no race difference within the overall incidence of 6% for alcohol use.

None of these maternal characteristics affected the gender of the offspring (Table 2).

TABLE 2. Incidences (Per Cents) of Maternal Conditions and Tests for Races and Sex Differences

Variable	Blacks		Whites		Race Difference			Sex Difference		
	M (228)	F (183)	M (54)	F (35)	G	df	Odds Ratio	G	df	Odds Ratio
Rural residence	9.6	9.8	22.2	34.3	16.5*	1	3.4	0.3	1	1.2
Maternal age under 20 yrs	40.8	34.4	25.9	37.1	3.0	2	1.4	0.5	2	1.1
Gravidity one§	31.6	25.1	29.6	34.3	1.8	2	1.1	1.4	2	1.2
≥ 1 Abortions	19.7	24.6	42.6	31.4	10.0*	1	2.2	0.2	1	1.1
No previous term sibs	45.6	39.9	51.8	48.6	8.2*	2	1.3	1.5	2	1.2
No previous preterm sibs	95.2	91.3	88.9	94.3	0.6	1	1.4	0.9	1	1.4
Tobacco user	18.0	19.7	40.7	42.9	19.5*	1	3.1	0.1	1	1.1
Alcohol user	6.1	5.5	9.3	8.6	1.1	1	1.6	0.1	1	1.1

§ Gravidity includes the newborn.

* $P < 0.05$.

TABLE 3. Incidences (Per Cents) of Neonatal conditions and Tests for Race and Sex Differences

Variable	Blacks		Whites		Race Difference			Sex Difference		
	M (228)	F (183)	M (54)	F (35)	G	df	Odds Ratio	G	df	Odds Ratio
Birth weight under 2750 gms	19.7	29.5	13.0	22.9	4.8	2	1.6	13.9*	2	1.8
C-H length under 49 cm	24.6	43.7	18.5	28.6	4.4	2	1.7	19.7*	2	2.3
Lip pits	8.8	9.8	7.4	8.6	0.2	1	1.2	0.2	1	1.1
Leukoedema	39.5	41.0	14.8	8.6	28.4*	1	4.8	0.1	1	1.0
Median alveolar notch	21.9	25.7	11.1	8.6	11.3*	3	2.7	3.4	3	1.2
Midpalatal cysts	57.0	51.4	79.6	68.6	13.7*	2	2.5	3.0	2	1.3
Alveolar cysts	11.8	10.4	29.6	20.0	23.2*	1	3.3	0.5	1	1.2
Lymphangioma	2.2	2.2	0.0	0.0	3.6*	1	#	0.0	1	1.0
Ankyloglossia	5.7	2.2	7.4	2.9	0.4	1	1.4	4.4*	1	2.7
Congenital epulis	0.0	0.0	0.0	0.0	—	—	#	—	—	#
Natal teeth	0.0	0.0	1.8	0.0	—	—	#	—	—	#

Undefined; cannot calculate; no occurrence in whites.

* $P < 0.05$.

Race Differences

Five oral anomalies exhibited significant differences by race.

Leukoedema was almost five times as likely to occur in black infants. Leukoedema presents as diffuse gray-white folds in the buccal mucosa which disappear when the mucosa is stretched. It has been suggested that this condition is a function of the degree of melanin pigmentation (Martin and Crump 1972; Shafer et al. 1983).

Median alveolar notches were not infrequent overall (21%), but were significantly more common in black

neonates, both in presence and severity. Newborn blacks were almost three times as likely (OR = 2.7) to exhibit a clearly discernible notch and there is speculation that notching is associated with a midline diastema in the primary and permanent dentitions (Jorgenson et al. 1982).

Palatal cysts appear as whitish nodules at the junction of the hard and soft palate adjacent to the midpalatal raphe (Bohn's nodules) or within the median raphe of the hard palate (Epstein's pearls). Lesions usually range from three to six in number and are 1 mm or less in diameter. Most of the lesions in this series (80%) were found at the hard-soft palate juncture. Midpalatal cysts are common (58% in the total sample), but were 2.5 times more likely to occur in white newborns (75%) than black (55%).

Alveolar cysts also were considerably more likely (OR = 3.3) to occur in whites, with an incidence of 26%, than blacks (11%). Alveolar cysts are grayish-white nodules along the crest of the alveolar mucosa or, less commonly, on the lingual or facial borders.

Alveolar lymphangioma likewise exhibited a strong ethnic predilection; it was found in 2.2% of the blacks

contrasted with no cases in the whites (0/89). These lymphangiomas appear as blue, domed, fluid-filled lesions on the alveolar ridges of either arcade. They typically occur bilaterally.

Gender Differences

Aside from the anticipated gender dimorphisms for birthweight and crown-heel length (male > female) (Hamill et al. 1977), ankyloglossia was the one trait to achieve statistical significance with respect to gender. Males exhibited a higher incidence of the anomaly with an odds ratio of 2.7 which approximates a 3:1 gender difference. Blacks and whites are equally likely to exhibit this condition, with an overall incidence of 6.0% in males and 2.3% in females.

Other Predictor Variables

Each of the eight characteristics recorded for the mother (Table 1) also was tested for statistical dependence with the oral anomalies and status of the offspring. To conserve space, only the noteworthy associations are mentioned here.

Mothers who smoked (any level of self-reported smoking was scored positive) were at a significantly greater risk of having lower birthweight infants than nonsmokers. Standardized deviations from the chi-square table disclosed that the shift in birthweight due to smoking attenuated the incidence of "high" birthweights (> 3450 g) and increase the average interval (2750-3450 g). Mothers who smoked also had a greater incidence of newborns with shorter crown-heel lengths. As for length, the major source of significance was the deficit of offspring from smokers in the longer crown-heel category (> 52 cm).

Maternal age was a significant predictor of alveolar lymphangioma ($G = 11.0, 2 \text{ df}, P = 0.004$). Teenage mothers were at enhanced risk of having a child with this condition. This association also was evident in tests of variables which vary with age: Gravidity and lymphangioma have a negative relationship ($G_2 = 6.9, P = 0.03$) as does parity ($G_2 = 4.6, P = 0.10$). Of the 9 observed cases of alveolar lymphangioma, only one involved a mother more than 20 years of age.

None of the other oral anomalies tested by incidence or severity (Table 1) was associated significantly with any of the maternal characteristics which are divisible widely into age, number of pregnancies, and habits (tobacco, alcohol). There was a significant association between the occurrence of ankyloglossia and birthweight, but this disappeared when corrected for gender (more common in males who tend to be heavier at birth).

Discussion

Race and Gender Comparisons

Few studies have assessed the oral status of newborns. The principal purpose here was to determine trait incidences of clinically observable oral anomalies at birth. Among the 500 full-term neonates examined, all in well-baby nurseries, palatal cysts and alveolar cysts occurred significantly more often in whites. Blacks were more likely to possess median alveolar notch and leukoedema. Alveolar lymphangioma was present only in black infants. These data parallel previously reported frequencies of these conditions by race (Cataldo and Berkman 1968; Martin and Crump 1972; Jorgenson et al. 1982).

The etiology of leukoedema is unknown, but it is common in blacks (40%). This incidence is statistically the same as the 43% reported by Jorgenson et al., but both are lower than the 51% found by Martin and Crump ($P < 0.001$). The discrepancy may center on the fact that Martin and Crump examined school-age children, and the condition, probably associated with degree of pigmentation, may be age progressive.

Although palatal and alveolar cysts are similar clinically and histologically, palatal cysts were more common (58% of the total sample) than alveolar cysts (25%). This discrepancy may be explained by the study of microsections of stillborns' palates (Cataldo and Berkman 1968) in which the histologic presence of alveolar cysts was confirmed in cases lacking clinical manifestation. Consequently, a substantial number of alveolar cysts may go unrecorded since they are not discernible macroscopically.

No palatal cyst was found in the premaxillary region of the hard palate. All were posterior to the incisive foramen. The most common location was at the junction of the hard and soft palates with the rest being distributed along the median palatal raphe. If the pathogenesis of the lesion depends on entrapment of epithelium during fusion of the palatal shelves (Fromm 1967), we expected cysts to be present where the premaxilla fuses with the maxillary processes. Absence from the more anterior location might be explained by the fact that the premaxilla is the first portion of the palate to fuse. Therefore, by birth, any cyst formed in this area may already have degenerated.

Median alveolar notch was present, to some degree, in 20% of the total sample. Jorgenson et al. (1982) suggested a possible relationship between this anomaly and future development of a central diastema, noting that blacks exhibit a predisposition for expression of each condition. A prospective study could confirm or disprove a causal role.

The only oral finding that demonstrated a predilection by gender was ankyloglossia which occurred three

times more often in males. Ankyloglossia results either from a short lingual frenum or an attachment of the frenum toward the tip of the tongue. Treatment for this condition is indicated only if speech is overtly impaired due to lack of proper functioning of the tongue, or if a periodontal condition develops from pull of the lingual frenum (McEnery and Gaines 1942; Mathewson et al. 1966).

Similar results were reported by Jorgenson et al. (1982); pooling the studies yields population estimates of 3.3% for males and 1.2% for females, with an associated odds ratio of 2.9.

A significant association existed between maternal age and alveolar lymphangioma. Teenage mothers (who also tended to be primiparous) were at greatly enhanced risk (OR = 14.5) of having offspring with alveolar lymphangioma. This trait first was described by Levin et al. (1976) who suggested that bilaterality of lesions and their specific locations indicated a possible odontogenic origin. However, they noted that this may be questioned since lymphangiomas also occur extraorally.

Conclusions

Based on the 500 neonates examined in this study, the following conclusions were drawn:

1. The occurrences of several oral anomalies differed significantly with respect to race and gender:
 - a. Midpalatal and alveolar cysts occurred more frequently in whites
 - b. Alveolar lymphangioma was observed only in blacks
 - c. Median alveolar notch and leukoedema were seen more often in blacks
 - d. Ankyloglossia was observed three times more often in males.
2. Children of teenage mothers possessed an increased incidence of alveolar lymphangioma.

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