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Socioeconomic correlation of oral disease in six- to thirty-six month children

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Abstract

A survey of 441 children between the ages of 6 and 36 months who were born and reared in a fluoridated water supply area revealed dental caries in 0 percent of children 6 to 11 months of age, 4.2 percent of those 12 to 17 months of age, 19.79 percent of the 24- to 29-month group, and 36.4 percent of those 30 to 36 months of age. In 299 Caucasian children, gingivitis was present in 13.2 percent of those 6 to 17 months old, 33.9 percent in the 18- to 23-month group, and 38.5 percent of those 24 to 36 months of age. Caries prevalence and severity of gingivitis were unrelated to sex, race, and socioeconomic status, although middle and middle-low socioeconomic groups showed a trend toward higher caries frequencies. The total absence of dental care in these young children illustrates the necessity for prevention and treatment of oral disease in children under 36 months of age.

Introduction

Little information is available concerning the prevalence of dental caries in a fluoridated community for children less than three years of age. In 1957 Wisan, Lafell, and Colwell[1] completed a non-fluoridated area survey of 2,677 Philadelphia children between two and five years of age and found 18.4 percent of 200 two-year-olds with caries and .6 deft. By three years of age 52.9 percent of the children had dental caries, with an average deft of 2.20. Caries incidence was less in higher socioeconomic groups, which supported the work of Cohen in 1936.[2] Tank and Storvick[3] stated that for a non-fluoridated community in Oregon, the prevalence of caries in the one-, two-, and three-year-old age groups was 11 percent, 46 percent and 89 percent respectively. In the 1 ppm fluoridated community involved in the same study, 3 percent of the one-year-olds and 45 percent of the three-year-olds had dental caries. Hennon, Stookey, and Muhler[4] surveyed 915 children between 18 and 39 months of age, in a non-fluoridated area of Indiana, and reported that 8.3 percent of the 48 children in the 18- to 23-month-old group, 57.2 percent had caries. These studies, some of which used a limited sample and varying diagnostic criteria, all show some indication of caries prevalence in children three years old and younger. However, only Tank and Storvick[3] identified dental caries prevalence in children within artificially fluoridated areas between the ages of 6 and 36 months.

In regard to gingival health status, clinical studies[5,6] confirm that the most frequently observed periodontal disease entity in children is gingivitis. Jamison[7] stated that almost three-fourths of the children with deciduous teeth have gingivitis distributed independently of the educational status of the mothers. In their study, Tank and Storvick,[8] found that the prevalence and incidence of gingivitis, in children aged one through six, were less in the 1 ppm fluoridated community than in the non-fluoridated community.

The present investigation was designed to determine the prevalence of dental caries and the gingival health status in six- to thirty-six-month-old children who were born and reared in a community with an optimally fluoridated water supply. These data were then correlated with the socioeconomic level of the family.

Methods and Materials

A total of 441 Indianapolis area children (299 Caucasians and 142 Blacks) from patients in pediatric clinics and private practices were selected for the study. The following criteria were used: six- to thirty-six-month-old normal, healthy children, born and reared in the fluoridated water supply area of Indianapolis. The child's participation was dependent on a voluntary commitment by the accompanying parent. A socioeconomic, medical background questionnaire (Figure 1) and consent form were completed by the parent. Each patient's parent received a brief consultation and a pamphlet, developed by one of the investigators, on the proper care of the child's oral health. When the findings of the examination indicated a need for dental care, the parents were so informed.

Child's Name_____ Sex_____ Age_____ Date of Birth_____
Child's Address_____ How long?_____
Describe the occupation (job) of head of your household. _____
_____
Indicate Industry_____
Circle highest level of education of head of household 1 2 3 4 5 6 7 8 9 10 11 12 College 1 2 3 4 5 6 7 8 Other_____
Is anyone else in your household employed? Yes_____ No_____
If yes, please describe their job and relationship to you. _____
_____
Circle highest level of education of spouse 1 2 3 4 5 6 7 8 9 10 11 12 College 1 2 3 4 5 6 7 8 Other_____
Do you have city or well water in your home? _____
Has your child ever resided outside of Indianapolis? _____
If yes, where? _____How long? _____
Has your child ever been hospitalized or had a serious illness? _____
If yes, explain: _____
Has you child had any history of the following? (If yes, please check)

_____Heart Trouble	_____Allergies	_____Kidney or Liver Disease
_____Asthma	_____Epilepsy	_____Diabetes
_____Anemia	_____Nervousness	_____Rheumatic Fever
_____Hepatitis	_____Tuberculosis	_____Bleeding Disorders

Figure 1. The socioeconomic medical history questionnaire.

For the examination, the child was either cradled on the lap of the parent or placed on an examining table. All examinations were performed in the private pediatricians office or in public medical or dental clinics by the senior author in a prescribed manner, beginning in the maxillary left posterior quadrant and ending in the madibular right posterior quadrant. A mouth mirror, explorer, and chip blower were utilized. If the child had teeth with closed contacts, anterior and bitewing radiographs were made at Indiana University School of Dentistry. Approximately 15 percent of the children had radiographs taken alone or on the parent's lap and were protected by a lead apron. The data were recorded on diagnostic sheets developed at the Indiana University Oral Health Research Institute. The criteria for diagnosis of dental caries were the ones suggested by Radike,[9] which include changes in enamel translucency, retention of the explorer point and softness at the base of the questionable area, or any definite radiolucency indicating a break in the continuity of the enamel surface.

The Papillary — Marginal — Gingivitis — Index (PMGI) a combination of the Gingival Index by Loe and Silness,[10] and the PMA Index by Massler and Schour,[11] was employed for scoring gingivitis. The gingival examination was limited to the tissue surrounding the deciduous teeth present. If 20 deciduous teeth were present, there were 44 gingival papillae, and 40 gingival margins to be examined. A total of 84 gingival units were at risk, scored and divided into the four areas of the mouth: maxillary posterior, maxillary anterior, mandibular anterior, and mandibular posterior. The severity of gingivitis for each patient, as rated by the PMGI, was indicated by the sum of all inflammation scores divided by the number of papillary and marginal units examined. Black subjects were not used for gingivitis recordings due to their inconsistent gingival colors.

Socioeconomic Evaluation

A Two Factor Index of social position utilizing occupational and education scales developed by Hollingshead and others,[12-15] was used for the socioeconomic classification of each child. The Two Factor Index utilizes occupational and education scales as follows:

Rankings — Occupational Scale
(Constant factor = 7)

1. Higher executives of large concerns, proprietors and major professionals.
2. Business managers, proprietors of medium-size businesses and lesser professionals.
3. Administrative personnel, owners of small businesses and minor professionals.
4. Clerical and sales workers, technicians and owners of little businesses.
5. Skilled manual employees (Plumber*).
6. Machine operators and semi-skilled employees.
7. Unskilled employees.
8. Unemployed (category added as a modification).

Rankings — Educational Scale
(Constant factor = 4)

1. Professional (M.A., M.S., M.E., M.D., Ph.D., L.L.B., D.D.S., etc.)
2. Four year college graduation (A.B., B.S., B.M.)
3. 1-3 years college (Plumber*).
4. High school graduate
5. 10-11 years of school
6. 7-9 years of school
7. Under 7 years of school

The score that each family head received on each scale was multiplied by an approximate constant-factor for each scale. To illustrate: a plumber* who went to trade school two years receives a "5" on the occupational scale ranking and a "3" on the educational scale ranking. The "5" is multiplied by the constant occupational factor of 7, resulting in a partial score of 35. The "3" is multiplied by the constant educational factor of 4, resulting in a partial score of 12. These partial scores total 47, which falls into the Class III* range (34-51), representing an index of middle socioeconomic status. The range of total scores in each class on the Two Factor Index follows:

	Class	Range of Total Scores
High	I	11-18
	II	19-33
Middle*	III	34-51
	IV	52-66
Low	V	67-84

An estimate of the distribution for the inhabitants of Marion County, based on the Hollingshead index of

Table 1. Caries and gingivitis frequency.

Caries					Area Percent Gingivitis						
Age Months	No Pts.	Caries%	Deft	Defs	Age Months	No. Pts.	Max. Ant.	Max. Post.	Mand. Ant.	Mand. Post.	Total Area
6-11	64	0	0.0	0.0	6-17	113	12.4	0	1.8	0.9	13.2
12-17	95	4.20	0.128	0.457							
18-23	88	10.23	0.238	0.454	18-23	56	21.4	10.7	19.6	17.8	33.9
24-29	96	19.79	0.604	0.739							
30-36	99	36.40	1.101	1.444	24-36	130	13.1	13.8	6.1	31.5	38.5
Total	441	15.42%	0.453	0.673	Total	299	14.4%	8.0%	7.0%	17.4%	28.1%

occupational and education scales of the 1970 Census, was completed and compared with that of the examined study population. A Chi-Square analysis indicated no significant difference ($p > 0.05$) between the study sample distribution and the distribution of all Marion County families.

Results

All parents' requests for an examination of their children in the preliminary screening group were honored. However, the results of only 441 were included due to the strict criteria of the survey. Table 1 shows that the number and percentage of children with caries increased with the age of the child. Caries were found in 68 of the 441 children (15.42 percent), with the number increasing in rapid progression from 0 percent at 6 to 11 months to 36.4 percent at the 36-month age group. The deft value increased from 0 in the 11-month age group to 1.101 in the 36-month age group, while the defs went from 0 to 1.444 in the same age groups. There were no statistically significant differences in deft and defs values between Blacks and Caucasians ($p > 0.05$).

The gingival scores were divided into four regions of the oral cavity and the relative frequency of gingivitis compared by age groups (Table 1). As noted earlier, Black subjects were not included in gingivitis scores due to their inconsistent gingival colors. The overall frequency of the children with gingivitis was 28.1 percent. The mandibular posterior area had the greatest frequency of gingivitis (17.4 percent), with the most common site being the lingual of the mandibular deciduous molars. The maxillary anterior area had a frequency of 14.4 percent, with the most common site being the lingual of the maxillary incisors. The maxillary posterior area had an overall frequency of 8 percent, with the buccal of the deciduous first molars being the most common site. The mandibular anterior area had a 7 percent frequency, with the most common site being the lingual of the deciduous incisors.

When age groups were compared, the maxillary anterior was the most common site for gingivitis in children 6 to 17 months of age, with a 12.4 percent frequency. In the 18- to 23-month group there were no apparent differences among the various areas, but the overall frequency of gingivitis had increased to 33.9 percent. In those 24 to 36 months, 31.5 percent of the children had more gingivitis in the mandibular posterior area with a 38.5 percent overall frequency.

Caucasian children with gingivitis had statistically significantly higher deft and defs values than those without gingivitis ($p < 0.01$). Children in the 24- to 36-month-old group with gingivitis had a deft value (1.66), more than three times greater than the group without gingivitis (0.525); the total group had five times the deft value (1.15) of the group without gingi-

Table 2. Correlation of oral disease with socioeconomic groups.

Socioeconomic Group	No.	Mean Age (Months)	Deft	Defs	Gingivitis
			Mean ± S.E.	Mean ± S.E.	Mean ± S.E.
High	80	21.70	0.23 ± 0.08	0.26 ± 0.10	0.02 ± .0044
Middle High	84	22.27	0.23 ± 0.09	0.27 ± 0.13	0.05 ± .0183
Middle	102	22.97	0.63 ± 0.18	1.01 ± 0.36	0.03 ± .0092
Middle Low	119	20.94	0.69 ± 0.17	1.09 ± 0.32	0.04 ± .0086
Low	56	18.20	0.27 ± 0.11	0.37 ± 0.15	0.05 ± .0203
Total	441		0.45 ± 0.07	0.67 ± 0.12	0.04 ± .0054

Table 3. Results of dental caries prevalence surveys of young children.

Investigator	Age (Months)	Year	N	Deft	Defs	% Caries	Fluoride
Tank et al.	12 to 23	1965	96	0.08	0.09	3.0	+
Tank et al.	24 to 35	1965	73	0.59	0.56	21.0	+
Hennon et al.	18 to 23	1969	48	0.13	0.15	8.3	-
Hennon et al.	24 to 35	1969	708	1.36	1.81	35.3	-
Weddell	12 to 23	1980	183	0.18	0.45	7.1	+
Weddell	24 to 35	1980	164	0.85	1.146	25.6	+

vitis (0.23). The younger groups with gingivitis also had more teeth and surfaces involved, but had too few decayed teeth to be significant.

The results of a Newman-Keul's sequential ranking test on the mean deft, defs, and severity of gingivitis by socioeconomic groups showed no statistically significant group differences (Table 2). However, there were individual differences ($p = 0.06$), with a trend toward the middle and middle-low socioeconomic groups having higher caries rates (deft = 0.63 and 0.69, defs = 1.01 and 1.09) than the high, middle-high, and low socioeconomic groups (deft = 0.23, 0.23 and 0.27, defs = 0.26, 0.27 and 0.37). Since age is an important factor in relation to caries prevalence and since the mean age of the different socioeconomic groups in this study varied, comparisons among the groups were difficult.

Discussion

Caries frequency seemed to follow the eruption sequence of the primary teeth. The order of frequency of caries demonstrated were: smooth surfaces of the maxillary central incisors' proximal surfaces of the maxillary anterior teeth, then the occlusal surfaces of the primary first molars.

The deft value for one-year-old children, 12 to 23 months in this survey, was similar to those of Hennon et al.[4] and Tank and Storvick[3] (Table 3) with defs value higher, probably due to the increased number of children for this age group in this study. The 7.1 percent of one-year-old children with caries in this study shows a decrease from Hennon's 1969 findings in a non-fluoridated area and an increase over those reported by Tank and Storvick.[8]

The most recent prevalence surveys of dental caries of two-year-old children (24 to 35 months) in the United States are those by Hennon et al.[4] and Tank and Storvick.[3] In the present study caries prevalence values for these children in a fluoridated area, demonstrated a decrease from Hennon's values in a non-fluoridated area and an increase over those reported by Tank and Storvick.

The data in this study indicate that sex and race are not important factors in caries and that caries experience increases with age. The small number of one-, two- and three-year-old children who have actually visited dental offices is indicative of the limited interest in the dental needs of these children. It was also noted that no children presented for examination with previously restored teeth, despite an observed caries range of from 4.2 percent in the 12- to 17-month-olds to 36 percent in 36-month-olds.

There was no difference in mean gingival severity scores in relation to age, sex and socioeconomic groups. Even though eruption gingivitis was excluded, there seems to be a correlation between the presence of gingivitis and the most recently erupted teeth. This finding could possibly be due to the acute transitory nature of gingivitis in young children, in agreement with the finding of Poulsen.[14] The 12.4 percent prevalence of gingivitis in the 6- to 17-month-old group in the maxillary anterior area correlates positively with location of teeth present, lack of hygiene, and perhaps pooling of liquids in the area. The 18- to 36-month age group shows a sharp rise in frequency to 38 percent, with a shift in location to the mandibular posterior and the maxillary anterior areas. Although no statistically significant socioeconomic group differences were apparent, individual groups showed a trend for the high and middle-high groups to have lower deft and defs values than the middle-low socioeconomic group ($p = 0.06$).

Summary and Conclusions

A study of 441 children between the ages of six and 36 months, born and reared in a community having a fluoridated water supply revealed the presence of dental caries in 0 percent of children 6 to 11 months of age; 4.2 percent of those 12 to 17 months of age; 10.23 percent of the 18- to 23-month group; 19.79 percent of those 24 to 29 months old; and 36.4 percent of the 30- to 36-month-old children.

Of the 299 Caucasian children in the study, gingivitis was found in 13.2 percent of those 6 to 17 months of age, 33.9 percent of the 18- to 23-month olds, and 38.5 percent of the 24- to 36-month olds. The following conclusions were made:

1. Dental caries prevalence and severity of gingivitis are independent of sex and socioeconomic status, although middle and middle-low socioeconomic

groups show a trend toward higher caries frequencies. As well, caries prevalence is independent of race.
2. Dental caries and gingivitis frequency increases with age.
3. There is an increased prevalence of gingivitis in young children with dental caries compared to children without dental caries.
4. Parents, dentists, and other health professionals involved with the care of young children need to be more aware of their dental needs and of the necessity for much earlier treatment for the prevention of dental disease.

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Quotable Quote

Diabetes mellitus and its complications are now thought to be the third leading cause of death in the U.S., trailing only cardiovascular disease and cancer. According to a report issued by the National Commission on Diabetes in 1976, as many as 10 million Americans, or close to 5 percent of the population, may have diabetes, and the incidence is increasing yearly. The direct and indirect effects of diabetes on the U.S. economy are enormous, exceeding $5 billion per year. If current trends continue, the average American born today will have better than one chance in five of ultimately developing the disease. The likelihood of becoming diabetic appears to double with each decade of life and with every 20 percent of excess body weight.

Many aspects of diabetes remain mysterious, but recent work in three seemingly unrelated fields — genetics, immunology, and virology — has supported the contention that diabetes is a heterogeneous group of diseases rather than a single one. This work has also indicated that diabetes arises from a complex interaction between the genetic constitution of the individual and specific environmental factors.

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