HYPOCALCIFICATION AND HYPOPLASIA IN PRIMARY TEETH OF PRE-SCHOOL CHILDREN FROM DIFFERENT ETHNIC GROUPS IN SOUTH AFRICA

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ABSTRACT

A study was completed in 1985/86 which examined the dental health of pre-school children from different ethnic groups and communities in South Africa: rural black, urban black, urban colored, urban Indian, and urban white. Enamel defects were recorded in primary teeth by use of the HHI, an index developed to measure hypocalcification and hypoplasia of enamel. The findings showed that colored children had the greatest number of enamel defects. The teeth most commonly affected were the maxillary anterior teeth and mandibular molar teeth. It is suggested that further epidemiological studies utilizing the HHI should be undertaken in pre-school children, especially from developing countries, to gain more information on the causes of enamel defects in the primary dentition and the possible use of such findings to predict nutritional health of individuals.

INTRODUCTION

A new index (HHI) was developed to look at enamel defects in the teeth of South African children (Hargreaves *et al.*, 1989). The initial results of defects found in the permanent teeth of 11-year-olds from different ethnic groups in South Africa have been reported (Hargreaves *et al.*, 1989). The HHI lends itself equally well to studies of enamel defects in the primary dentition. The index is descriptive, but allows for the possibility of relating the condition to the onset time of etiological cause, an important factor that could be used in assessments of the health and nutrition of young children. The following study was undertaken to screen the children to determine both numbers involved and teeth affected.

MATERIALS AND METHODS

The study was completed during 1985/86 in 1491 pre-school children ages 1-4 years from different ethnic groups in South Africa. The children seen consisted of 253 rural black, 298 urban black, 313 urban colored, 307 urban Indian, and 320 urban white. All the children resided in regions with less than 0.35 ppm F in their drinking water. The selection of the children has been described previously (Cleaton-Jones *et al.*, 1989). In addition to recording several dental and nutritional parameters, we used the HHI (an index to measure hypocalcification and hypoplasia of enamel) (Hargreaves *et al.*, 1989). Each individual primary tooth present in a child's mouth was classified.

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RESULTS

The percentages of children showing any sign of hypocalcification or hypoplasia of enamel are shown in Table 1; the urban colored children had the most involvement. Since all the primary dentition had not erupted in the 388 one-year-old children (mean age 1.47 ± s.d. 0.27 years), the data from these children were also looked at with regard to the maxillary and mandibular incisors only. The percentages of those children with hypocalcified or hypoplastic teeth were: rural black, 1.69; urban black, 1.82; urban colored, 8.11; urban Indian, 3.85; and urban white, 4.08. The nine categories of HHI are shown in Table 2. The most common type of lesion affecting the teeth was linear enamel hypoplasia, involving the incisal or occlusal half of a tooth crown (category 3). Table 2 gives the findings for the HHI categories by ethnic group; the urban white children had the smallest number of teeth with defects. When specific homologous teeth were examined (Table 3), the teeth most commonly involved in the maxilla were primary central and lateral incisors and first molars. In the mandible, the first primary molars were the teeth most usually affected. Table 3 also gives the specific teeth involved by ethnic group.

DISCUSSION

Enamel defects in the primary dentition have been reported by several investigators (Sarnat and Schour, 1941, 1942; Massler and Perlstein, 1958; Miller and Forrester, 1959; Grahnén and Edlund, 1967; Grahnén *et al.*, 1974; Levine and Keen, 1974). Pimlott *et al.* (1985) recently found that, for low-birth-weight children, a high number had enamel defects in the primary maxillary central incisors, but these authors failed to demonstrate a relationship between enamel hypocalcification and any birth parameter. They stated that the unravelling of specific metabolic factors that might relate to formation of an opalescent area awaits further epidemiological study.

Fluorosis in the primary dentition has been reported (Thylstrup, 1978), but the fluoride level in the drinking water of the children in the present study was less than 0.35 ppm F and was not considered to be a cause.

Simonton and Jones (1927) described a condition they called odontoclasia. In primary teeth, they demonstrated enamel defects showing stained areas as spots or broad masses with bands encircling the crowns. The opacities were described as white, cream, gray, yellow, green, brown, or black. They also described carious-type lesions associated with the defect. Later, Jones *et al.* (1930) described odontoclasia in an examination of 1761 pre-school children in Hawaii, and showed defective enamel of the primary teeth to be subject to dental caries. They described the teeth most usually affected as being the primary maxillary incisors and the mandibular first and second molars. Sweeney and Guzman (1966) and Sweeney *et al.* (1971) described a similar enamel defect in Guatemalan children, again mainly involving primary maxillary incisors with a linear type of hypoplasia. These defects were seen commonly in malnourished children – 73.1% of children with third degree malnutrition, and 42.9% of children with second degree malnutrition, specifically suffering from kwashiorkor and marasmus. They speculated that these enamel defects, when seen, should alert health officials either to a possible nutritional deficiency or to the fact that the children may develop a generalized nutritional health problem at a later date.

In the present study, the children most commonly affected were from the colored community. These children had the most defects, and they occurred mainly in the primary maxillary anterior and first primary molar teeth. The urban black and colored children had the most involvement of the primary second molar teeth, although no group showed high association with these teeth. It is possible to speculate that this may be due to extended breast-feeding (over one

TABLE 1
HHI: CHILDREN 1-4 YEARS OF AGE

		Children Showing any Sign of Hypocalcification or Hypoplasia of Enamel	
	n	% of children with hypocalcification/ hypoplasia	% of children with >4 teeth involved
Rural black	253	5.9	3.2
Urban black	298	7.4	3.6
Urban colored	313	16.3	8.7
Urban Indian	307	9.1	1.0
Urban white	320	7.2	0.6

TABLE 2
HHI: CHILDREN AGED 1-4 YEARS

	Percentage of Teeth Involved by Category and Ethnic Group					
Categories of HHI	Rural black n = 253	Urban black n = 298	Urban colored n = 313	Urban Indian n = 307	Urban white n = 320	All children n = 1491
1	0.22	0.34	0.89	0.20	0.13	0.36
2	0.27	0.20	0.14	0.24	0.06	0.18
3	0.63	1.31	2.84	0.03	0.00	0.96
4	0.45	0.20	1.17	0.02	0.06	0.38
5	0.04	0.03	0.06	0.47	0.41	0.20
6	0.01	0.08	0.16	0.14	0.05	0.08
7	0.08	0.15	0.10	0.21	0.25	0.16
8	0.10	0.34	0.05	0.15	0.00	0.13
9	0.00	0.00	0.00	0.00	0.00	0.00
All categories	1.80	2.65	5.41	1.46	0.96	2.45

TABLE 3
HHI: CHILDREN AGED 1-4 YEARS

	Percentage of Homologous Tooth Types Involved by Ethnic Group					
Maxillary Teeth	Rural black n = 253	Urban black n = 298	Urban colored n = 313	Urban Indian n = 307	Urban white n = 320	All children n = 1491
1	2.18	4.03	8.79	4.07	3.44	4.60
2	2.97	4.36	7.92	2.77	1.57	4.06
3	2.18	3.86	6.39	0.65	0.47	2.72
4	3.36	4.36	9.74	1.63	0.63	3.96
5	0.99	1.01	1.28	0.65	0.47	0.87
Total	2.34	3.52	6.82	1.95	1.32	3.24
Mandibular Teeth						
1	1.38	1.01	2.40	1.30	0.00	1.21
2	1.19	1.34	2.08	0.98	0.16	1.14
3	1.58	1.35	4.95	1.31	1.10	2.08
4	1.78	3.69	8.79	1.08	0.94	3.32
5	0.40	1.34	1.28	0.17	0.79	0.80
Total	1.27	1.75	3.90	0.97	0.60	1.71

year for many of the black and colored children) and the time of weaning, which normally would have commenced before age six months in the Indian and white communities (Richardson *et al.*, 1981). No conclusive reason can be given, however, to explain why maxillary anterior primary teeth should be more susceptible to developing defects than mandibular primary teeth.

Children between 1 and 2 years of age will show any enamel defects in their anterior teeth, which could be used as a useful early evaluation before the molar and canine teeth have erupted. The present investigation was taken as a screening study to look at differences between ethnic groups and was not conducted to look at specific medical histories or early nutritional deficiencies.

The suggestion of using defects found in the primary maxillary teeth at eruption (4 to 8 months) as an indicator of possible nutritional deficiencies should be studied further and could become a useful health indicator. More epidemiological studies to look at enamel defects in the primary teeth of children in different population groups, especially children living in developing countries, should be undertaken.

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