

# Oral conditions in Australian children of Aboriginal and Caucasian descent

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**Abstract** - Oral health parameters were examined for 211 schoolchildren (128 Aborigines and 83 Caucasians) representative of the 6-8 and 10-11 year age groups in the Brewarrina and Walgett areas of western New South Wales (fluoride in water  $\leq 0.02\text{--}0.26 \text{ parts}/10^6$ ). Despite similar dietary carbohydrate challenge and tooth eruption patterns, Aboriginal children, most of whom were members of a transitional community within a low socioeconomic stratum, had higher prevalence of caries (DMFT) and severity rating of carious lesions (SR), poorer oral hygiene (OHI) and more gingivitis (PI) than Caucasian children, in both age groups. Tooth defects were more frequent (2.5 times) and severe in Aborigines than in Caucasians. Outstanding treatment needs were very high in both ethnic groups, but more so in Aborigines.

**Key words:** Aborigines; dental caries; gingivitis; oral hygiene; tooth defects; treatment needs.

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The Orana and Far West Health Region of New South Wales includes the most remote parts of the state; it occupies 346 000 km<sup>2</sup> (over the combined area of Eastern and Western Germany) and has 130 000 inhabitants. Most household water supplies are fluoride deficient, but comprehensive water fluoridation is impractical because reticulated water supplies are limited to towns and townships. At 1 to 3000, the dentist to population ratio is low by Australian standards and is further aggravated by the concentration of dentists in the main centres. Thus, several small towns and vast rural areas lack effective dental services and large distances make access to dental care difficult.

These circumstances suggested the implementation of an intensive oral health care program by the school dental service, which caters for children in infant and primary schools. Of particular concern were the Aboriginal children, who constitute up to 80% of the school population in some areas and who are at an increased risk because of the low educational standard, socioeconomic status and earning

capacity of their parents. This report deals with the results of a pilot survey of schoolchildren carried out in 1978, aimed at defining oral health status, treatment needs and related parameters to facilitate the design and implementation of the oral health care program.

## MATERIAL AND METHODS

The sample comprised 211 children (95 males and 116 females; 128 Aborigines and 83 Caucasians) lifelong residents in the Brewarrina and Walgett areas of the Orana Region of New South Wales, and representative of the 6-8 and 10-11 year age groups attending state primary schools. Children who regarded themselves to be of Aboriginal descent were so classified.

Prior to examination, informed consent was requested from the parents in writing and from the children in person. Those who consented were assessed with respect to tooth eruption status, dental caries, enamel hypoplasia and opacities (permanent teeth only), oral hygiene, gingivitis, soft tissue lesions, occlusal anomalies, emergency treatment needs and diet. As a provision for avoiding possible bias arising from different duration of exposure to caries risk in the ethnic groups, the state of eruption of permanent teeth was recorded on the

following scale: 0=unerupted or excluded; 1=less than one third of the crown visible; 2=one third to two thirds of the crown visible; and 3=over two thirds of the crown visible or lost through caries. Enamel hypoplasia and opacities were graded according to the index of DAVIES, LOSEE, CADELL, KEAN & LUDWIG (4). Dietary patterns were analysed using the method of DUANY, ZINNER & JABLON (5), modified to include locally consumed foods. For the remaining variables the criteria of the World Health Organization (9) were used, but teeth indicated for extraction were separately noted (DIMFT). Moreover, carious lesions were also graded according to severity using a modification of an index, the mean severity score, previously employed in relation to tooth surfaces (6). The severity rating (SR) of carious lesions was based on assigning an arbitrary weight to each lesion according to its penetration and destructiveness. In calculating the SR, restorations were omitted because it is not possible to determine the penetration of a restored lesion in retrospect. For this reason the SR is only meaningful in populations which receive little or no dental care. The SR was derived for each subject in two steps. First, a weighted DIMT (WDIMT) score was calculated by multiplying the number of teeth in each of the following categories by the appropriate weighting, and summing the products:

Category	Weighting
Initial caries of enamel	2
Advanced caries of enamel	4
Caries of dentine (without pulp involvement)	6
Indicated for extraction (major structural breakdown and/or probable pulp involvement)	20
Missing due to caries	20

As the second step, the WDIMT score was divided by the number of affected teeth, to give the SR. The latter index reflects the average intensity of lesions per individual, which is not apparent from the DIMFT score. As an extreme example, one of two persons each with DIMFT scores of 2, may have two teeth affected by initial lesions only, whereas the other may have lost two teeth through caries. The difference between the severity of the conditions is reflected by the difference between the respective severity ratings of 2 and 20. When a tooth had more than one distinct lesion, the highest corresponding weighting was used.

Examinations were carried out in a mobile dental clinic using standard illumination and visual and tactile means,

without radiographs (9). Water samples were collected at different seasons, in duplicates, from a comprehensive range of outlets of public water supplies and from roof catchment tanks. The samples were analysed for fluoride content using the specific ion electrode (Orion®, model 96-09). Details of the accuracy and precision of the method have been previously described (7).

Standard statistical procedures were used for calculating means and standard deviations and the Student t-test was used for examining differences between means.

## RESULTS

Roof catchment rain water was widely used for drinking and cooking, often in preference to the water obtained from the public supplies. At 0.02 parts/10<sup>6</sup>, its fluoride content was within the blank level. The fluoride content of water samples collected from public supplies ranged from 0.07 to 0.25 parts/10<sup>6</sup> in Brewarrina and from 0.07 to 0.26 parts/10<sup>6</sup> in Walgett. The lowest values in each locality were obtained for filtered river water.

The results relating to the oral variables are presented with localities and males and females combined, because preliminary examination of the data showed no significant differences in caries experience by location or sex.

The mean values for age, the number of erupted permanent teeth and the average degree of eruption (sum of eruption stages divided by number of erupted teeth per person) are shown for Aboriginal and Caucasian children in Table 1. The nearly identical mean ages and small standard deviations indicate a high degree of homogeneity within both age strata. It is also apparent that comparisons between ethnic divisions will not be biased by differences in the number of teeth exposed to risk or by the length of exposure to caries challenge.

Table 1. Means of age, number of erupted permanent teeth and degree of tooth eruption in Aboriginal (A) and Caucasian (C) children

	6-8 years				10-11 years			
	A	C	t	P<	A	C	t	P<
n	51	31			77	52		
Age (year)	7.1 (0.7)	7.1 (0.5)	0	NS	10.7 (0.8)	10.5 (0.8)	1.39	NS
No. erupted teeth	7.0 (3.0)	7.5 (3.0)	0.73	NS	18.0 (5.2)	18.3 (5.3)	0.32	NS
Degree of eruption	2.34 (0.37)	2.28 (0.24)	0.76	NS	2.69 (0.20)	2.65 (0.26)	0.78	NS

( )=s.d.

Table 2. Mean caries experience and severity rating (SR) of carious lesions of Aboriginal (A) and Caucasian (C) children

	6-8 years				10-11 years			
	A	C	t	P<	A	C	t	P<
n	51	31			77	52		
DIMFT	2.0 (1.6)	1.2 (1.6)	2.20	0.05	3.9 (2.8)	3.7 (2.2)	0.45	NS
SR	4.1 (4.7)	1.3 (1.8)	3.79	0.001	6.7 (5.7)	4.4 (4.2)	2.64	0.01

( )=s.d.

Table 2 shows the mean values for caries experience. In the 6-8 year age group, where the first molars were the only permanent teeth at risk for a substantial period, Aboriginal children had a significantly greater number of carious teeth than their Caucasian peers. The difference was even more pronounced regarding the SR, which indicated that, on the average, the lesions were nearly three times as progressive and destructive in Aboriginal than in Caucasian children. In the 10-11 year group the difference in the mean number of teeth affected was marginal, but the difference in SR remained substantial and significant, to the detriment of the Aboriginal children. The proportions of caries-free Aboriginal and Caucasian children were 29% and 58% in the 6-8 year group; these were reduced to 5% and 6%, respectively, in the 10-11 year group.

Enamel hypoplasia and opacities affected 16.8% of the fully erupted permanent teeth of Aboriginal children and 7.5% of the teeth of Caucasian children in the 6-8 year group; the corresponding figures were 17.5 and 7.6% in the 10-11 year group.

The mean values of indices relating to oral

hygiene and gingivitis are set out in Table 3. Overall, the oral debris values indicated the presence of soft deposits over the apical third of tooth crowns and, because of the very low prevalence of calculus, accounted for nearly the total value of the oral hygiene index. The latter was 32-35% higher in Aboriginal children than in Caucasians; the differences were significant at the 2.0 and 0.1% levels in the 6-8 and 10-11 year age groups. The mean periodontal index was at or below the mild gingivitis level; Aboriginal children were again at a disadvantage with values nearly twice as high in the 6-8 year group and 33% higher in the 10-11 year group than Caucasian children. The differences were significant at the 0.1 and 1.0% levels, respectively.

Oral soft tissue lesions, other than gingivitis, were diagnosed in 6.8% of children; all were inflammatory conditions, arising from the retention of non-vital teeth or as the consequence of poor oral hygiene. These conditions occurred 13 times as frequently in Aborigines as in Caucasians.

Occlusal anomalies, such as severe malocclusion or crowding and misalignment of teeth, were

Table 3. Means of indices related to oral hygiene and gingivitis of Aboriginal (A) and Caucasian (C) children

Index	6-8 years				10-11 years			
	A	C	t	P<	A	C	t	P<
n	51	31			77	52		
Oral debris	1.06 (0.37)	0.85 (0.30)	2.81	0.01	1.27 (0.44)	0.97 (0.35)	4.27	0.001
Calculus	0.03 (0.09)	0.03 (0.11)	0	NS	0.07 (0.26)	0.05 (0.13)	0.59	NS
Oral hygiene	1.09 (0.37)	0.88 (0.36)	2.55	0.02	1.34 (0.56)	1.02 (0.36)	3.95	0.001
Periodontal	0.95 (0.50)	0.55 (0.34)	4.30	0.001	0.95 (0.45)	0.73 (0.33)	3.22	0.01

( )=s.d.

Table 4. Proportionate distribution of the components of the DMFT index for Aboriginal (A) and Caucasian (C) children

	6-8 years		10-11 years	
	A	C	A	C
n	36	13	73	49
D%	97.2	94.2	73.8	55.5
I%	2.8	0.0	9.3	1.7
M%	0.0	0.0	3.1	2.3
F%	0.0	5.8	13.8	40.5

observed in 5.5% of Aboriginal and 3.7% of Caucasian children.

In the age groups examined routine treatment needs related mainly to caries and can be discerned from the analysis of the DMFT values, presented in Table 4. In the 6-8 year group the D component was exceptionally high, mainly reflecting lesions in the permanent first molars. At this stage no teeth were missing through caries, but nearly 3% were beyond restorative treatment; all teeth indicated for extraction were observed in Aborigines with the connotation that dental care was not available or utilized despite episodes of acute pain associated with pulp exposure. In contrast, the small proportion (5.8%) of filled teeth were seen solely in Caucasians. The overall F:D+I ratio of 1:30 attests to a nearly complete lack of restorative care, which is absolute in the case of Aboriginal children. In the 10-11 year group the D component was lower than in the 6-8 year group for both ethnic divisions and substantially lower in Caucasians than in Aborigines. By the age of 10-11 years the M component appeared in both ethnic groups and the I component increased sharply in Aborigines. The bulk of treatment needs remained unmet, in that over 57% of the affected teeth required restoration or extraction in Caucasians and 83% in Aborigines.

The "emergency treatment need" classification applied to 8% of the children, nearly 90% of whom were Aborigines.

Assays of the diet did not disclose significant differences between Aboriginal and Caucasian children with respect to the frequency of carbohydrate challenge in either age group.

1970, BARRETT & WILLIAMSON (2) concluded that "the caries experience of the present-day young people of the Yuendumu community still ranks among the lowest in the world". Whereas this view was fully justified by the finding of an average of 0.4 DMFT per person in their "juvenile" group (incorporating children with early and late mixed dentition), it contrasts sharply with the overall conclusion of the present study, that Aboriginal children were at a substantial disadvantage compared to their Caucasian peers with respect to every oral parameter examined, including dental caries.

These contrasting findings can be explained in part by the fact that the Yuendumu people are protected by fluoride in their water supply (1.3 to 1.8 parts/10<sup>6</sup> until 1965 and 0.4 to 0.8 parts/10<sup>6</sup> since) and partly by a possible timelag in changing from a traditional to a Western type of diet, which is known to be associated with increased caries prevalence in Aboriginal (3) and other transitional communities (1).

However, these factors do not explain the higher prevalence and greater severity of caries found in Aboriginal than in Caucasian children in the present study. In this context, it is pointed out that the reduction of the disadvantage of Aboriginal children from the 6-8 to the 10-11 year age group is regarded as transitory, owing to the large number of recently erupted and erupting teeth in the older group, which were not exposed to caries challenge for a sufficiently long period to show the consequences. This assumption is supported by the high caries experience of adolescent and young adult Aborigines examined in the same area (8).

The findings in relation to oral hygiene and gingivitis reflect the clinical impression that very few children of either ethnic group cleaned their teeth regularly or effectively, and many of them, particularly Aborigines, were completely unaware of the need for oral hygiene practices. Thus, the poorer oral hygiene may have contributed to the higher caries experience of Aboriginal children. However, we believe that a more substantial contribution was made by defective enamel formation. The approximately 2.5 times higher frequency of enamel hypoplasia and opacities found in Aboriginal children fails to illustrate the qualitative differences in the severity of defects which were apparent on clinical examination. The typical defects seen in Caucasian children were "idiopa-

## DISCUSSION

Following the examination of an Aboriginal population in the Northern Territory of Australia in

"thic" white spots affecting one or a few teeth. In contrast, a large number of Aboriginal children suffered from severe pitting and linear hypoplasia involving numerous teeth. The aetiological background of this condition and its implications regarding decreased resistance to caries are being investigated.

The disparity found in the number of restored teeth between Aborigines and Caucasians suggests that the relatively few filled teeth seen were treated by private practitioners, in children whose parents recognized the need for dental treatment and who could afford to meet that need. This observation, together with the very great backlog with respect to all other treatment requirements, points to utterly insufficient coverage of needs by the school dental service.

The results of this study confirm that the population examined is at a high caries risk and lacks adequate dental care. The findings support the need for an intensive and comprehensive preventive and curative oral health care program with special attention to Aboriginal children.

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