

# A brief review of indigenous Australian health as it impacts on oral health

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## Abstract

The indigenous population of Australia constitutes approximately 2 per cent of the total population. This group has faced significant cultural, economic and health changes since European settlement some 200 years ago. In this brief review some of the health changes that have influenced the oral health status of this community have been examined. Of major importance is the dietary change that the once nomadic indigenous community has undergone. Today's Western diet, high in sugar, low in proteins and vitamins, has resulted in a significant increase in the risk (and prevalence) of caries and periodontal disease. In addition, the high prevalence of diabetes also exacerbates the periodontal problem. The remoteness of a significant proportion of Australian indigenous communities from modern health care services and limited access to fluoridation increases the incidence of oral disease. It is also noted that the incidence of rheumatic heart disease is one of the highest in the world, thereby increasing the risk of bacterial endocarditis. It is clear that indigenous communities have unique oral health needs but the extent of these needs is not well documented. It is important that more research be undertaken to assess these needs so that appropriate oral health programmes can be developed.

**Key words:** Australia, Aboriginal, oral health, review.

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## Introduction

The indigenous population of Australia (the Aboriginal and Torres Strait Islander people) constitutes approximately 2 per cent of the total population of 18.3 million. The distribution of these people differs greatly between States with the greatest total number (108 300) living in New South Wales.<sup>1</sup> The details of the demographic distribution are depicted in Table 1. Many of the indigenous

people live either in rural settlements, distant from modern health facilities, or in marginalized urban fringe communities. It is under these conditions that a number of major community health problems exist. For example, the mean life expectancy for indigenous people is 15 to 20 years lower than that of non-indigenous people and is comparable with some central African countries and India.<sup>2</sup> Little current research has been undertaken examining these health problems in the context of oral health. This brief review examines the current literature and provides significant insights into the general health problems that have direct relevance to the current oral health status of the indigenous Australian community.

## Diet in relation to oral health

The traditional nomadic diet was low in sugar and contained a healthy balance of nutrients. However, the switch to a 'European' diet has meant that large quantities of white flour, sugar and tea are consumed and few fresh fruits and vegetables, having a deleterious impact on both general and oral health.<sup>3</sup> The foods purchased by rural and remote communities tend to be cheaper products containing large amounts of refined carbohydrates<sup>4</sup> resulting in a diet high in kilojoules but often deficient in vitamins and protein.<sup>3-6</sup> In 1982, an estimate of the sugar consumption of Groote Eylandters (a remote Aboriginal community) was 90 kg per person per year, which is twice the Australian average.<sup>7</sup> In 1975, a similar estimate at Elcho Island was over 3 kg of sugar per person per week being purchased (some 182 kg per year) which, at the time, was almost 3.5 times the national average.<sup>8</sup>

The increased consumption of sugar is reflected in increasing dental caries among indigenous people. Examination of Aboriginal skulls predating colonization (in 1788) found that dental caries was

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Table 1. The demographic distribution of the indigenous population as recorded in the 1996 census<sup>1</sup>

State and Territory	Indigenous population (000)	Total population (000)	Proportion indigenous (%)
New South Wales	108.3	6203.9	1.7
Victoria	22.6	4560.8	0.5
Queensland	100.5	3339.1	3.0
South Australia	21.3	1474.4	1.4
Western Australia	54.1	1765.7	3.1
Tasmania	14.7	474.6	3.1
Northern Territory	49.6	181.9	27.3
Aust Capital Territory	3.0	308.0	1.0
Australia	372.1	18 311.5	2.0

very rare.<sup>9</sup> Current data from Aboriginal communities following a traditional way of life corroborate these earlier findings, with caries incidence being low, while among groups which consume mostly Western foods caries prevalence is significantly higher.<sup>4</sup> In the Kimberley region of Western Australia, 3000 km north of the capital city, Perth, food prices are 40 per cent more expensive than those in Perth, encouraging the purchase of cheaper foods with poorer nutritional value.<sup>10</sup>

The high consumption of sugar is not the only dietary-related problem of the indigenous population. Malnutrition is also relatively common in children, making them more susceptible to infections.<sup>11</sup> This susceptibility, combined with poor oral hygiene among the rural and remote indigenous communities, leads to a higher risk of periodontal disease. A 1991 study reported frequent undernutrition among young children in the Kimberley region, due to a diet high in fat and sugar and low in calcium, fresh fruits and vegetables.<sup>12</sup> This same study noted that while the children were often malnourished, obesity became a problem among adults; this was associated with further health problems such as diabetes and hypertension. Another study in the rural south of Western Australia found that inadequate calcium, vitamin C and riboflavin intakes, as well as inadequate kilojoule intakes, were common in rural Aboriginal communities.<sup>13</sup> Widespread mild to moderate malnutrition in Aboriginal children in the sparsely populated region of northern Western Australia and widespread deficiencies in protein and kilojoule intake in Aboriginal children in rural and remote Queensland have been documented by others.<sup>10,14</sup> In one study from the Kimberley region, only 59 per cent of women of child bearing age and 76 per cent of children had adequate nutritional levels.<sup>15</sup> Rural Aboriginal children under three and women of child bearing age had vitamin deficiencies, with growth retardation occurring in 23 per cent of the children surveyed.<sup>16</sup>

In this study, detailed analyses of individuals found many to be deficient in kilojoule intake, calcium, iron, and vitamins C, B1, B2, B6, and E.

The high prevalence of poor nutrition among indigenous communities almost certainly gives rise to a significantly greater susceptibility to periodontal disease. Also, deficiencies in vitamin C (due to a lack of fresh fruit) can lead to conditions such as scurvy, with its direct deleterious effects on oral health. Malnutrition has also been suggested as a cause of severe enamel pitting and hypoplasia found on the teeth of some Aboriginal children; hence, an increase in dental caries.<sup>17-19</sup> This, combined with poor oral hygiene and a diet high in sugar, has the potential to increase the risk of both periodontal disease and dental caries in rural indigenous populations.<sup>20-22</sup>

### Role of medical conditions in oral health problems

There are two medical conditions, diabetes mellitus and rheumatic fever, which have a significant impact on oral health and are prevalent among indigenous communities.

#### Diabetes

Diabetes occurs with alarming frequency among rural and remote indigenous communities and has the potential to significantly increase periodontal disease and dental caries. Type II, or non-insulin-dependent diabetes mellitus (NIDDM), is the most common form suffered within indigenous communities.<sup>23</sup> NIDDM has been associated with an increased prevalence of periodontal disease and dental caries<sup>24-26</sup> among poorly controlled patients. A study in the USA showed significantly more gingival bleeding among type II diabetics than those with impaired glucose tolerance or no metabolic disorder.<sup>24</sup> It has also been reported that subjects with NIDDM are up to 3.4 times more likely to have periodontal disease than people without diabetes, and these differences are not related to differences in plaque or calculus levels.<sup>25,26</sup> Other oral health problems which are thought to be related to NIDDM are oral mucosal lesions<sup>24</sup> and oral dryness, leading to *Candida albicans* infections.<sup>26</sup> The length of time an individual has suffered diabetes and the level of control are significantly correlated with the severity of periodontitis and tooth loss.<sup>25</sup> Unfortunately, this is a vicious cycle as the loss of teeth leads to the avoidance of healthy foods in favour of soft, sugary and fatty foods, which in turn encourages obesity and increases the risk of diabetes.<sup>27</sup> There is a dearth of data on this link in the rural and remote indigenous populations and this field requires a sustained research effort.

Epidemiological analysis of diabetes among indigenous communities varies, due mainly to the difficulty in determining population sizes in nomadic groups. Cross-sectional analysis found the

prevalence of diabetes in Aboriginal communities in central Australia to be 5.3 per cent in the below 35 year age group, and 29.6 per cent in the over 35 year olds.<sup>28</sup> Others, examining the prevalence of hyperinsulinaemia, reported significantly higher insulin levels in Aboriginals than non-Aboriginals.<sup>29</sup>

Many studies have shown that the frequency of diabetes is significantly higher in Aboriginals compared with Australians of Caucasian origin. A 1987 study in the Kimberley region of Western Australia showed that 8-19 per cent of Aboriginals suffered from diabetes, compared with only 2.3 per cent of non-Aboriginals.<sup>30</sup> An earlier study in the Kimberley area found that 16 per cent of Aboriginal men and 19 per cent of Aboriginal women suffered from diabetes.<sup>31</sup> Among urbanized Aboriginal communities, up to 24 per cent suffered from diabetes.<sup>32</sup> For comparison, the rate of diabetes among Caucasian Australians is thought to be 3.4 per cent.<sup>32</sup> One study of an Aboriginal community which reverted to a nomadic lifestyle, found that glucose tolerance improved dramatically and an average of 8 kg of body mass per person was lost over 7 weeks.<sup>33</sup>

Within the indigenous community, diabetes occurs mostly in the over 30 age group and, in some areas, up to one in three Aboriginals over the age of 35 has diabetes.<sup>33</sup> The high rate of diabetes in indigenous communities significantly increases the risk of periodontal disease. This makes it crucial that indigenous communities are aware of the necessity for good oral hygiene and that they have adequate access to dental care in order to minimize tooth loss.

Clearly, it is incumbent upon the dental profession to take an active role in developing culturally-specific strategies to improve the oral health of indigenous Australians. By linking oral health programmes with existing general health programmes, comprehensive and appropriate strategies can be developed. This research group in the School of Oral Health Sciences at UWA is currently developing programmes in collaboration with various indigenous health providers in Western Australia.

### ***Rheumatic fever***

Rheumatic fever usually first occurs in childhood, initiated by streptococcal infections (which can originate from oral bacteria), and the disease is generally recurrent.<sup>34</sup> Attacks of rheumatic fever can leave permanent damage on the heart valves which, in severe cases, will impair function.<sup>34</sup> In a person who has had rheumatic fever, bacterial endocarditis may arise from oral bacteria such as streptococci, staphylococci, enterococci, or *Candida albicans*.<sup>35</sup> Bacteraemia, leading to bacterial endocarditis, can occur through dental procedures.<sup>36,37</sup> This is particularly important when treating indigenous

patients, since the rate of rheumatic fever amongst this group has been cited as the highest in the world.<sup>38</sup> In 10 rural communities in the 'Top End' of the Northern Territory, it was estimated that 651 cases per 100 000 people (0.6 per cent) of acute rheumatic fever occurred per annum. Similarly, the prevalence of rheumatic heart disease was also reported as high (0.9 per cent).<sup>39</sup>

As with diabetes, the measured prevalence of rheumatic fever among indigenous populations varies considerably. Estimates from remote areas of the Northern Territory of Australia have ranged from 6.5 to 9.6 per 1000.<sup>40</sup> In Western Australia, estimates ranged from 2.3 to 3.5 per 1000 in Aboriginal school children.<sup>41</sup> One of the highest rates was at the Yarrabah community in Queensland, with one study showing a rate of 21.6 per 1000.<sup>42</sup> Rates of rheumatic fever in developed countries tend to be between 0.002 and 0.005 per 1000 and in developing countries from 0.05 to 1.00 per 1000.<sup>40</sup> This places the rates of rheumatic fever among indigenous populations far above what should be tolerated in a developed nation such as Australia. The use of prophylactic programmes for the prevention of rheumatic fever has been a successful public health measure.<sup>42</sup> The unusually high rates of rheumatic fever mean that extra precautions need to be taken by dental health professionals working within indigenous communities.

### **Fluoride**

The dental benefits of fluoride have been well established. Remote areas of Australia generally do not have artificial water fluoridation and they have to rely on natural fluoride levels. These fluoride levels vary from low levels (0.02 to 0.26 ppm) in the Brewarrina and Walgett areas of New South Wales<sup>43</sup> to high levels such as 1.5 ppm at Yuendumu in the Northern Territory and Carnarvon in Western Australia.<sup>44,45</sup> The high variation in fluoride levels results in different susceptibilities to dental caries between groups. In areas such as Yuendumu, levels are so high that as well as affording protection from caries, a high incidence (30 per cent) of fluorosis has been reported.<sup>44-46</sup> In the areas with lower concentrations (0.02 ppm), there is little or no protection against caries.

In many areas it is necessary to provide supplementary fluoride treatment for children in schools, as artificial fluoridation of water sources is often not feasible. Public health measures such as mouth rinses or fluoride tablets need consideration.

At Groote Eylandt in the Northern Territory a programme of artificial fluoridation was implemented in 1973; this raised fluoride levels to between 0.65 and 0.8 ppm.<sup>47</sup> Although the programme was

expensive, at a cost of 5 cents per person per day, and there were difficulties with its maintenance, there was a significant decrease in caries incidence from 1974 to 1978 in an area with previously high levels of dental caries.<sup>7,47</sup>

Similarly, in 1968 in the goldfields area of Western Australia, fluoridated water (0.9 ppm) began to be pumped 500 km from the coast. After 6 years of receiving fluoridated water a reduction in DMFT was observed and the number of teeth requiring extraction decreased.<sup>7</sup> It appears that, like all communities, the introduction of fluoridated water can have beneficial results for indigenous communities by reducing the prevalence of caries. Since high levels of dental caries have been shown in many studies of various Aboriginal populations without fluoride protection,<sup>5,6,43,48,49</sup> it is evident that providing adequate fluoride protection should be a high priority dental public health issue.

This discussion has focused on water fluoridation. However, other methods of fluoride delivery may well be more appropriate with some communities. Strategies such as fluoride mouth rinses in a school-based programme,<sup>50</sup> fluoride tablets<sup>51</sup> or fluoridated milk<sup>52,53</sup> are just some of the alternative methods of providing fluoride in communities.

## Conclusions

The indigenous Australian community is a high risk population for oral diseases such as dental caries and periodontal disease. Because a significant number of communities are in remote locations, dental services are limited. Their poor oral hygiene combined with a diet high in refined carbohydrates results in a high rate of both dental caries and periodontal disease. Also, diabetes, which is related to obesity and a diet high in sugar and fat, has been linked to both increases in periodontal disease and dental caries. Rheumatic fever also poses a unique problem for dental practitioners: the rate of rheumatic fever infections among indigenous communities is one of the highest in the world and, as such, many people suffer from rheumatic heart disease. Areas where caries rates are found to be low coincide with areas where water fluoride levels are high. Areas with high levels of fluoridation appear to have a reduced prevalence of caries suggesting that implementation of fluoride treatment programmes for school children and, where possible, fluoridation of water sources would be an appropriate public health initiative. It is clear that indigenous communities have unique oral health needs. However, the extent of these needs is not well documented. It is important that more research be undertaken to assess the current oral health needs so that appropriate measures to manage these needs can be developed.

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