

Trends in dental caries prevalence, severity and unmet treatment need levels in South Africa between 1983 and 2002

SADJ August 2010, Vol 65 No 7 p310 - p314

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ABSTRACT

Objectives: To determine trends in dental caries prevalence, severity and unmet treatment need levels amongst South African children.

Methodology: Data obtained from three National Oral Health surveys (1982, 1988/89, 1999/2002) was used.

Results: Prevalence of caries amongst 12-year-old children decreased from 64.4% (1982) through 54.9% (1988/89) to 41.7% (1999/2002) and the DMFT decreased significantly ($p < 0.05$) from 2.54 (1982) through 1.73 (1988/89) to 1.17 (1999/2002). Unmet treatment need increased from 70.5% (1982), 72.3% (1988/89) to 75.2% (1999/2002). Significant decreases ($p < 0.05$) were recorded in the DMFT (1982-2002) in White, 75.3%; Asian, 64.1%; Black, 49.8%; and Coloured groups, 44.8%. High levels of untreated caries (D) and very low levels of treatment (M and F) were also observed. The highest mean dmft/DMFT for 6- and 12-year-olds respectively were recorded in the coastal areas of Metro Cape (5.1/1.86); followed by Port Elizabeth (3.86/1.37) and Durban (3.42/1.33); and the lowest in the interior - Bloemfontein (2.47/0.73).

Conclusions: Caries reduced significantly during the past 20 years; is more prevalent and severe amongst Coloured and Black population groups and in coastal regions compared to the interior region. Unmet treatment need in 12- and 15-year-old children increased and more than 70% of caries in 6-, 12- and 15-year-old children go untreated.

Key words: dental caries, prevalence, severity, oral health surveys, unmet treatment need levels

INTRODUCTION

Worldwide, large variations in the trends with regard to the prevalence and the severity of dental caries have been reported.^{1,2,3} The development of caries within populations has followed different patterns in different parts of the world, but in most highly developed countries there was a sharp increase in prevalence and incidence of the disease during the 1920's to 1950's. Caries became recognized as a major oral health problem in these countries, notably in the 1950's and early 1960's, when demand

for care increased. Some countries recorded that almost no child was free from caries. Whole populations were affected by a painful and distressing disease to which large amounts of public and private resources were allocated, not only to provide a professional workforce and the finances to treat the disease, but also for the investigation of possible ways to prevent it.¹

As a consequence, mainly due to the increased use of fluorides from all sources, especially toothpastes, a decrease in dental caries among children in highly developed countries started to emerge around 1970, and the percentages of caries free children in different age categories have increased since then.^{1,3} Certain developing countries, on the other hand, have reported an increase in dental caries.^{1,4} This was related to the increased availability and consumption of refined sugars. Concern has also been expressed about the relationship between caries and the trend towards urbanization in many developing countries; as people leave established rural conditions and move to large cities, where they are exposed to modern eating habits, there is an increasing risk of dental caries.⁵ There are few resources for curative/restorative intervention and no infrastructure upon which to base large-scale measures for prevention. Dental caries is therefore potentially of major public health significance in developing countries, and the need to focus on its prevention is a matter of urgency.^{1,2}

South Africa faces a unique challenge; it has to provide health care systems to cater for the needs of its varied population consisting of a spectrum from highly industrialized first world to underdeveloped third world communities.⁶ In order to promote health equity, there is a need for regular surveillance of caries trends in South Africa.

PROBLEM STATEMENT AND RATIONALE

The new political dispensation in South Africa since 1994 has been associated with efforts to improve the socio-economic status of previously disadvantaged individuals/ groups. As a result of this process, oral health interventions for the poorest, historically disadvantaged population groups may need to be different from those designed for middle or high socio-economic status population groups.⁷ Failure to recognize this differentiation will mean that intervention strategies are ineffective because they are se-

lected for application in a socio-economic and political context that no longer exists.⁷ Thus, knowledge of the trends in dental caries status and severity in South Africa is much needed before attempting to design intervention strategies to address dental caries. To date, only limited information is available on the assessment of caries trends in South Africa on a national level. Apart from a systematic review done by Cleaton-Jones and Fatti⁸ on the prevalence and severity of dental caries in South Africa and Swaziland and in which they reported decreasing caries rates in children, no other studies reflecting trends on a national level were conducted. In addition, it is important to examine the influence of the increasing migration of previously disadvantaged groups to urban or metropolitan areas.

OBJECTIVES

The purpose of this study was to determine the trends in dental caries;

1. prevalence and severity over the period 1983 to 2002 in South Africa,
2. distribution across different geographical regions in South Africa,
3. distribution in terms of age, race and gender in South African children and
4. unmet treatment need (UTN) in children in South Africa.

RESEARCH METHODOLOGY

During the past 25 years, three national surveys were conducted to determine the prevalence and severity of dental caries in South Africa on a national scale. Williams in 1983⁹ reported on the dental health status of 12-year-old children representing the whole country. The National Department of Health¹⁰ conducted a National Oral Health Survey in 1988/89 to determine the oral health status of adults and children (6-, 12-, and 15-years of age) in the five major metropolitan areas of South Africa. A similar study, amongst 6-, 12-, and 15-year-old children, involving the whole country, was again conducted during the period 1999-2002.¹¹

Data obtained from the three National Oral Health Surveys mentioned was used to determine the trends in dental caries prevalence, severity and treatment levels amongst South African children. In all the surveys the World Health Organization (WHO) methods with regard to dental caries were followed.^{12,13,14}

Changes in the prevalence, severity and unmet treatment need levels of dental caries were evaluated by comparing the prevalence, severity and unmet treatment need levels in a specific geographical location in either 1982/1983 or 1988/1989 (time₁) with the same group in the same area for either 1988/1989 or 1999/2002 (time₂). The annual percentage change was calculated by dividing the difference in the prevalence and severity of dental caries between time₂ and time₁ by the number of years between time₁ and time₂. The annual percentage change in prevalence and severity was calculated by dividing the difference in prevalence and severity between time₁ and time₂ expressed as a percentage /DMFT/dmft by the number of years between time₁ and time₂.

For the dimension of place (geographical location) the following variables were compared; regions in certain provinces and coastal and interior locations. Statistical analysis of caries distribution will focus on four regions within four provinces of South Africa namely: Metro Cape in the Western Cape, Port Elizabeth

in the Eastern Cape, Durban in Kwa-Zulu Natal and Bloemfontein in the Free State Province, as only these areas had data consistently available over the study period. In terms of the dimension person, the variables: gender, age group, and population group were compared. The study refers to four main population groups which are defined in the literature as follows: Asians, 2.5% of the population; mainly people of Indian descent. Blacks, 79% of the population; descendants of African peoples who migrated in a southerly direction from central Africa. Coloureds, 8.9% of the population; people of mixed parentage, mainly descendants of the indigenous Khoi Khoi people, the Malayan slaves and the White settlers. Whites, 9.5% of the population; descendants of the European settlers, mainly Dutch, British, German, French and Portuguese.¹⁵

Using Statistix 8.0 the following statistical tests were performed:

- A two sample proportion test was used to determine if there was a statistical significant change in the prevalence of dental caries amongst the different age groups (6-, 12- and 15-year-olds), across gender and across population groups. If a statistical significant difference existed between the mentioned parameters, the p-values were recorded. However where the number of successes were less than five (5), Fisher's Exact, as well as the p-value, were recorded.
- An association test, using two by two tables/chi-square, was used to compare the total of a population's severity (dmft/DMFT) of dental caries from 1982/1983 with the total of a population severity (dmft/DMFT) to 1988/1989 and/or to 1999/2002; as well as amongst the various age and gender groups.
- Statistical significance was established if the calculated p-value was smaller than 0.05 (p<0.05).

RESULTS

In terms of the variable time the prevalence of dental caries amongst 12-year-old South African children is shown in Figure 1.

The results of the survey show a decrease (Figure 1) in the prevalence of dental caries amongst 12-year-old children, from 64.4% in 1982/83, through 54.9% in 1988/89 to 41.7% in 1999/2002. Therefore, a total decrease of 22.7% over a 20-year period or 1.14% per year. It also appears that the difference between male and female has disappeared.

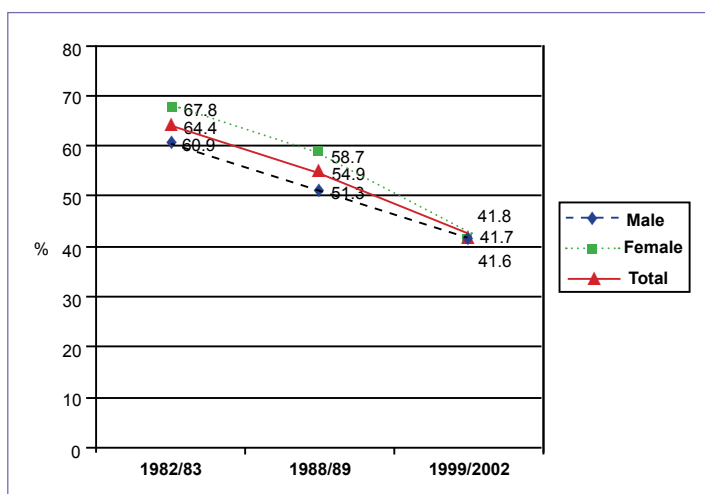


Figure 1: Trends in the percentage prevalence of dental caries, among 12-year-olds in South Africa by gender

Table 1: The DMFT/dmft and the D/d component of the DMFT/dmft expressed as a percentage of the DMFT/dmft (UTN)

	1982/83			1988/89			1999/2002		
	DMFT /dmft	D/d	UTN %	DMFT /dmft	D/d	UTN %	DMFT /dmft	D/d	UTN %
6-year-old*				3.16	2.66	84.18	3.13	2.51	80.19
12-year-old	2.54	1.79	70.47	1.73	1.25	72.25	1.17	0.88	75.21
15-year-old				3.23	2.08	64.39	2.35	1.82	77.45

* Primary teeth

Table 2: Trends in the mean DMFT and components of the DMFT amongst 12-year-old children by population group

	1982/83				1988/89				1999/2002			
	DMFT	D	M	F	DMFT	D	M	F	DMFT	D	M	F
Asian	2.95	2.05	0.65	0.25	1.30	0.90	0.10	0.30	1.06	0.64	0.26	0.16
Black	2.15	1.80	0.35	0	1.70	1.40	0.30	0.05	1.08	0.90	0.15	0.03
Coloured	3.75	2.35	1.20	0.20	2.00	1.20	0.50	0.30	2.07	1.46	0.41	0.20
White	3.85	1.20	0.10	2.40	1.80	0.40	0.10	1.20	0.95	0.35	0.07	0.53

In order to obtain an objective view of the quantity of services provided for the treatment of dental caries, the unmet treatment need (UTN) is calculated. The UTN, expressed as a percentage is calculated by dividing the D/d component of a particular group with the DMFT/dmft of the same group.¹⁶ The DMFT/dmft, the D/d component and the unmet treatment need in South Africa between 1983 and 2002 is shown in Table 1.

The results of Table I show a significant decrease ($p < 0.05$) in the DMFT from 2.54 in 1982/83 through 1.73 in 1988/89 to 1.17 for the 1999/2002 survey in the 12-year-old group. This decrease was also evident in the 15-year-old group. The UTN in 12-year-old children, however, increased from 70.47% (1982/83) to 72.25% (1988/89) to 75.21% (1999/2002); and in 15-year-old children from 64.39% (1988/89) to 77.45% for the 1999/2002 survey. This increase in the UTN took place, despite a decrease in the prevalence and severity of dental caries, implying a reduction in the quantity of dental services rendered to school children. In the 6-year-old group the opposite was observed showing a decrease in the level of untreated caries between 1988/89 and 1999/2002.

Trends in the severity of dental caries, per subject, amongst 12-year-olds, by population group, per National Oral Health Survey, are shown in Table 2.

Table 3: Severity of dental caries across geographical locations 1999/2002

Age	dmft/DMFT	Metro Cape	Port Elizabeth	Durban	Bloemfontein
6	dmft	5.09	3.86	3.42	2.47
12	DMFT	1.86	1.37	1.33	0.73
15	DMFT	4.05	2.00	1.95	1.53

A statistically significant ($p < 0.05$) decrease is observed in the DMFT from 1982 to 2002 in all the population groups. The largest reductions were recorded in the White group, 75.3%; the Indian group, 64.1%; the Black group 49.8%; and the least in the Coloured group 44.8%. The results also show high levels of untreated caries (D) and very low levels of treatment (M and F) in all groups, except the White group. The severity (dmft/DMFT) of dental caries, across geographical locations is shown in Table 3.

In the 1999/2002 survey the highest mean dmft/DMFT scores for

dental caries were recorded in the coastal areas of the Metro Cape (5.09); followed by Port Elizabeth (3.86) and Durban (3.42); and the lowest in the interior - Bloemfontein (2.47). Further analysis of the severity of dental caries show dental caries to be more severe in the primary than in the permanent dentition and also that the DMFT increased significantly from the 12- to the 15-year-olds.

DISCUSSION

A very positive observation, in terms of dental caries, in this study, is the huge reduction in dental caries prevalence and severity in the permanent teeth of children during the past 25 years. This reduction may be attributed to the widespread use of fluoridated toothpaste in South Africa.¹⁷ Analysis of the severity of dental caries, amongst children in the current study, shows dental caries to be more severe in the primary than in the permanent dentition. These findings seem to be consistent with other studies done in South Africa and on the African continent.^{18,19} Studies suggest that caries of the primary dentition is associated with early protein-energy malnutrition.²⁰⁻²⁴ Social, demographic and lifestyle factors relating to the mother have also been shown to influence the early eating patterns of children.²¹ These were: the addition of sugar to the child's comforter and the number of times per day this is done, how often the child is put to sleep with a bottle, whether the child is breast-fed or not and the length of time the child was breast-fed.

The results of the current study amongst 12-year-old children (Table 1) show a reduction in the severity (DMFT) of dental caries. The DMFT however, increased significantly from the 12-year-olds to the 15-year-olds. In other studies^{18,25} it was found that this increase could mainly be attributed to caries on the second permanent molar. As children get older there is an increased exposure to cariogenic agents, this fact combined with the position of the second permanent molar in the mouth make it more vulnerable to the caries attack.^{22,26,27}

The results of Table 1 also show a decrease in the UTN in the six-year-old group between 1988/89 and 1999/2002 and an increase in the UTN in 12- and 15-year-old children between 1983 and 1999/2002 and 1988/89 and 1999/2002 respectively. These changes in the levels of untreated caries could be attributed to major policy changes prior to and during the periods mentioned.

In 1975 the “first” National Oral Health Policy²⁸ was introduced in South Africa and the aim of this policy was to expand public oral health services, to shift the emphasis from curative services to preventive services and to bring all oral health services under the umbrella of the national Department of Health. Prior to 1975, oral health services were rendered by municipalities, provincial departments of health, the national department of health and even provincial departments of education.²⁹ In some provinces dentists were employed by the departments of education and their sole task was to visit schools and to provide dental services to school children. Although the school dental services continued after 1975 it was gradually replaced by dental services rendered at clinics in communities. The unexpected implication of this policy change was that school children received less dental services which are reflected in the increase in untreated caries in the 12- and 15-year-old group.

In 1994³⁰, free health services were introduced for pregnant woman and children under the age of six years and as a result provinces were forced to render more services to these categories of patients.³¹ Although the dmft for this group has remained relatively stable during the period 1988 to 1999/2002 the percentage of untreated caries has decreased by about 4%.

Mainly due to the initiatives of the European Union Presidency and the formation of the Global Child Dental Health Task Force, the South African National Dental Health Task Force was established on 26 July 2006.³² The aim of the task force was to improve oral health of children in South Africa. The strategies selected by the Taskforce will definitely contribute to improving oral health. Based on the impact that the above policy changes (1975 and 1994) had on service provision these efforts by the task force could be optimized by formalising the strategies in a national policy.

Compared to 12-year-old Asian, Black and White children, 12-year-old Coloured children present with higher dental caries prevalence and severity rates. This is confirmed by a previous report on dental caries being highest amongst the Coloured population in South Africa.^{26,33} This finding can be explained by the fact that in contrast to Black Africans, most Coloured South Africans live in the coastal Western Cape province, where drinking water fluoride levels are very low.^{34,35} Steyn *et al*²² also suggested that due to intake of sugars, people of the Coloured population group substantially have more caries than people of the Black population group. In South Africa, the socio-economic status of the Whites is still considerably higher when compared to that of the Black, Coloured and Asian populations.³⁶ Therefore, by implication, members of the White population have better access to fluoridated toothpaste, health promotional aids, dental services and consequently also enjoy better oral health.^{37,38}

Although many factors may contribute to the differences in the severity of dental caries across geographical locations (Table 3) the most likely explanation would be the availability of natural fluoride in the drinking water. It has been previously reported that in coastal provinces or regions such as: Metro Cape in the Western Cape; Port Elizabeth in the Eastern Cape and Durban in Kwa-Zulu Natal the fluoride levels are mostly lower than in the interior provinces/regions such as Bloemfontein in the Free State Province.^{18,34,39} Ockerse³⁹ attributed the differences in fluoride content in the drinking water to differences in the fluoride content of the underlying geological formations and the fact that in

the interior the fluoride content and total hardness of drinking water often from underground sources are high while the drinking water in the coastal regions is mostly of surface origin and the fluoride content and total hardness very low.

CONCLUSIONS

Dental caries prevalence and severity in the permanent dentition of children reduced significantly during the past 20 years. Dental caries is more severe in the primary than in the permanent dentition, while the severity of dental caries increased dramatically from 12- to 15-year-old children. Higher dental caries prevalence and severity rates were recorded in the coastal regions (Metro Cape, Port Elizabeth and Durban) as compared to an interior region (Bloemfontein). The percentage of untreated caries in 12-year- and 15-year-old children increased during the past 20 years, indicating a decrease in the dental services rendered to school children. More than 70% of dental caries, in 6-year-, 12-year- and 15-year-old children go untreated.

Declaration: No conflict of interests was declared

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