African Journal of oral Health
Volume 2 Numbers 1 & 2 2006: 6-18

ORIGINAL ARTICLE

Dental health among school population in Nigeria; do we sense any change?

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SUMMARY
The aim of this paper is establish levels of caries and periodontal diseases among 11-15-year-olds school population in central Nigeria and to relate the results to studies reported over the past thirty years or so in Nigeria. A population of 642 students were surveyed and examined for caries and periodontal diseases following WHO criteria for estimation of possible levels. Healthy periodontal conditions detected as (CPITN score; 0, 1 & 2) indicated relatively good oral health in school population of central Nigeria. Altogether, 85% of them were caries free and the mean DMFT was only 0.27. In addition, 10 studies reporting periodontal conditions and 17 studies reporting the caries situation were reviewed. Periodontal studies showed no evidence of severe periodontal diseases, however, high prevalence of calculus was found. Caries studies did not reflect any clear pattern of increase or decrease over time. Studies conducted in Lagos indicated that there is continuing increase in caries in this state. Other areas (Ile Ife and Ibadan) appeared to have a modest decline in dental caries prevalence. Ondo State showed a sharp increase followed by a decrease in dental caries. At a national level the magnitude of any caries increase is debatable. All present evidence seems to indicate that any tendency towards future increase in caries experience of 12-15 year-olds may occur in some parts of Nigeria, Lagos and Ondo States. However, the caries level in central Nigeria has remained low for the last 30 years.

INTRODUCTION

It is common to find developing countries discussed as a single population with similar trends in health and disease[1]. Furthermore it is commonly believed that the prevalence of dental caries in developing countries is increasing, though there is insufficient information to confirm this[2].

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Establishing possible trends in health and disease is important for long term planning and policy making[1]. This paper challenges the previous assumptions that disease levels are increasing.

During the early 80's all countries with low prevalence of dental diseases were thought to be experiencing an increase[3,4]. Divergence of opinions have emerged as trends in dental caries in developing countries. For example, the level of caries in WHO African region seems to be increasing [5,6] and most of

the disease remained untreated[5]. Manji and Fejerskov[7] pointed that the generalized characterisation of "caries increasing" in developing countries may not be true and available evidence suggests that there have been both increases and declines in caries experience in Africa. For example, studies have shown that caries experience in Bangladesh [8], Tanzania [2], Kenya [2], and Zimbabwe [9] has remained stable over the last 10-15 years, but Nigeria has continuously been mentioned as an example of a developing country where prevalence of caries is increasing [6, 10, 11.]

The prevalence of periodontal diseases has been reported as relatively high in Nigeria[6,12,13]. In 1966 Sheiham[14] noted that periodontal pocketing, using the Russell Index [15], becomes evident in Africa by the age of 8-14 years. According to WHO Global Oral Health Data Bank (GODB) at the age of 12-15 years there were no periodontally healthy individuals in Nigeria and more than half of the subjects had shallow pockets (56%), where as deep pocketing was rare[16]. However, another overview of the GODB in 1991 for the group of 15-19 years indicated that the majority of the subjects in Nigeria had calculus while none had shallow pockets[17]. In general, only 5%-20% of the population suffered from severe forms of periodontitis, even though moderate disease affects a majority of adults[18].

The aim of this paper is to review levels of both caries and periodontal disease among 11-15-years old school population in Nigeria over the past thirty years and to conduct a study with the purpose of examining current levels of dental diseases to challenge a belief that disease levels are rising.

SUBJECTS AND METHODS

The study was carried out in and around Jos, Nigeria. The oral health status of school population (n=642) aged 11-15 years was assessed. The data were collected as part of a baseline study for a health educational intervention programme in central Nigeria. Students were examined in 5 different schools in Plateau and Bauchi states. The equal numbers of students from each school were examined. Male (58%) and female (42%) students were randomly selected from the class lists. The schools represent both high and low socio-economic strata (SES). The state schools are attended mainly by children from the low socio-economic groups, while the more expensive private schools are attended predominantly by children from the high socio-economic strata. Schools from both rural and urban areas were included.

The examinations were carried out using the WHO criteria[19]. Classrooms were used as an examination area (natural day-light). All periodontal assessments were performed by one examiner (Dr. Oluwayanmife Adegbembo), using CPITN and the caries status by another examiner (Dr. May Ahmed Ismail) **.** A light weigh probe with 0.5 mm ball tip was used in the examination.

A total of 40 documents reporting oral health conditions in Nigeria were reviewed for evaluating the possible trends. The previous studies where the experience of caries and periodontal diseases for children were reported for the age range of 8-19 years in Nigeria were included. In comparisons the mean DMFT scores were used. Seven studies[16, 17, 20-24] reported periodontal conditions, three juvenile periodontitis[22, 25, 26] (currently called as aggressive

periodontitis) and 17 studies[27-43] reported the caries situation.

The data include both the percentages of caries free subjects and the mean DMFT for that population. We referred to the GODB for further information in the cases when publications had shortcomings. The 5-year-studies[39, 40] were analyzed according to the year when the studies were conducted. A total of 12 studies reported both the percentage of caries free subjects as well as the mean DMFT[20, 27, 29, 31, 32, 34, 35, 36, 38, 39, 41-43]. Those conducted by Henshow *et al.*[28,30] in 1974/75 were considered as national as they were conducted in the South, Kano, Sokoto, Jos, Ilorin and Moldoguri.

RESULTS

Prevalence of caries and periodontal diseases (This survey)

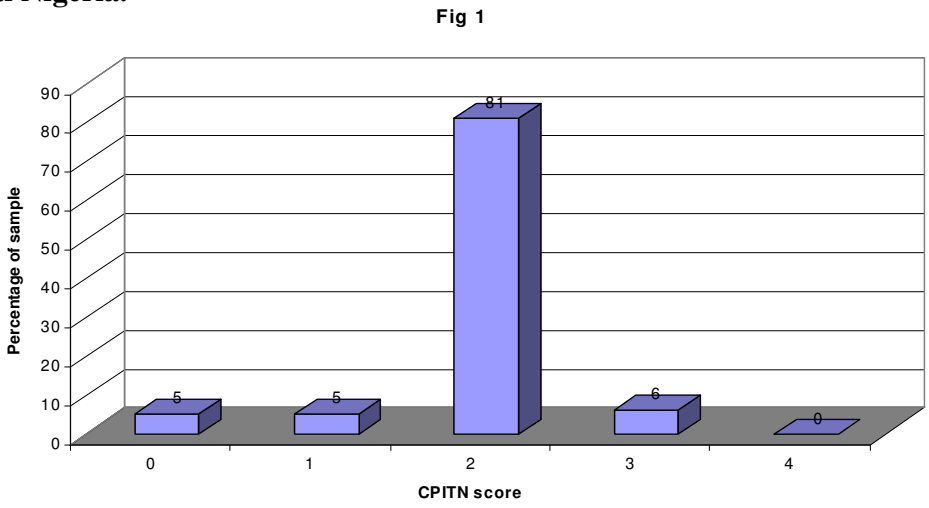
In central Nigeria, the CPITN examinations revealed that 93% of the school population scored 0,1 and 2. Pockets of 4 or 5 mm were found in 7% of the population (Table 1 & Fig. 1);

Table 1. Prevalence of caries and CPITN scores according to age (n).

Diseases Scores	Age/years				
	11 (45)	12 (125)	13 (151)	14 (137)	15 (184)
*Caries					
No caries %	71	81	90	85	86
Decayed %	29	19	10	15	14
**Periodontal Disease (CPITN)					
Healthy %	13	11	5	6	1
Bleeding %	16	5	7	4	6
Calculus %	71	84	86	87	71
Shallow pockets %	0	0	2	3	22

* $P \leq 0.05$ ** $P \leq 0.00$

Fig 1: Percentage distribution of CPITN score among 11-15-yr-old schoolchildren in central Nigeria.



the prevalence was increasing with age. More children were affected in rural than urban areas (Table 2).

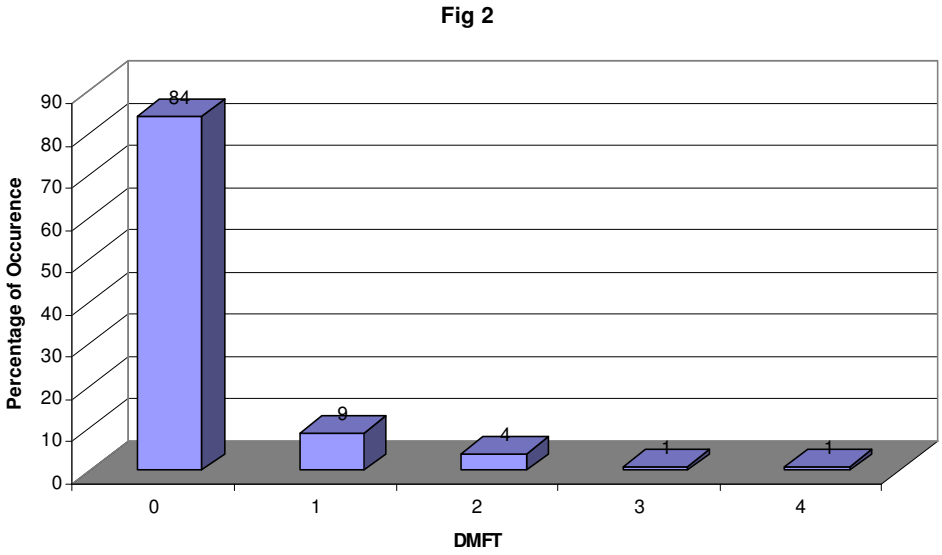
A total of 85% children were caries free (Table 1 & Fig. 2).

Table 2. Percentage-distribution of the CPITN scores according to location.

Location	CPITN Scores				
	Healthy (38)	Bleeding (40)	Calculus (520)	Shallow Pockets (48)	Deep Pockets (0)
Urban (277)	13	8	78	1	0
Peri urban (49)	4	6	80	10	0
Rural (316)	0	4	83	13	0

$P \leq 0.001$

Fig 2: Percentage distribution of DMFT score among 11-15-yr-old schoolchildren in central Nigeria.



The children coming from urban and rural areas, 81% and 87% were caries free respectively and the mean DMFT was 0.27. The proportion of caries free children increased from 11- to 13 years of age and then declined at the age of 14 and 15 years (Table 1).

The trends of caries and periodontal disease (assessed from the literature)

A total of 6 studies were conducted among 10-19-year-old children in Nigeria to assess the periodontal conditions (Table 3).

Table 3. Percentage-distribution of the CPITN scores in previous studies in Nigeria.

Study	CPITN scores according to the highest score per person						
	N	Healthy (0)	Bleeding (1)	Calculus (2)	4-5 mm Pockets (3)	>6mm Pockets (4)	AGE Groups Years
Akpabio (1983)*	544	4	11	85	0	0	15
Kubota (1986)*	97	8	12	60	20	0	15-17
Harley & Floyd (1988)	1001	0	8	70	22	0	12-19
Adegbembo et al (1995..)*	1154	1	3	46	42	8	15-19
Maduakor (1996)	138	12	61	26	1	0	14-15

*Global Oral Data Bank (GODB)

Two studies[16,23] indicated that 10% of the subjects had $\geq$ 6 mm pockets. Other studies showed that 4 or 5 mm pockets were found among 20% of the subjects[21, 22] and the studies conducted in 1987 and in 1990 (national) indicated even a higher prevalence of shallow pockets; 57% and 42 % respectively. Three studies indicated that all the children were healthy [20, 21, 24] (score 0, 1 and 2) and only one study considered that a half of the children had less healthy periodontitis[16]. The prevalence of juvenile periodontitis was low, 0.8%.

All caries studies with the exception of the national surveys[20, 27, 43] and the study of Henshow *et al* [31] were conducted in the South and South West of Nigeria. However, they do not reflect any certain pattern of increase or decrease in dental caries (Fig 3) except that the higher the DMFT the fewer caries free children. The highest peak for DMFT (3.1) was reported by Henshow and Adenubi 1975 followed by Arain & Arole[39] (2.7); Henshow in 1974 (2.5) and Arain in 1983 (2.2). National studies and studies conducted in different parts of Nigeria indicated that there was a sharp increase of DMFT between 1967[27] and 1974[29,31] and then followed a sharp decrease between 1983[20] and 1995[43] (Fig.3). Studies conducted in Lagos from 1974 to 1985 among 10-14 year-old children indicated that there is continuous increase in caries despite the low prevalence (mean DMFT 0.4) among 8-year-old children[37] (Fig. 4). Ile Ife and Ibadan areas appeared to have a modest decline in dental caries prevalence. Ondo state also showed a sharp increase followed by a decrease in dental caries (Fig.4)

Fig 3: **Caries-free percentages and the mean DMFT among the schoolchildren in the different surveys in Nigeria.**

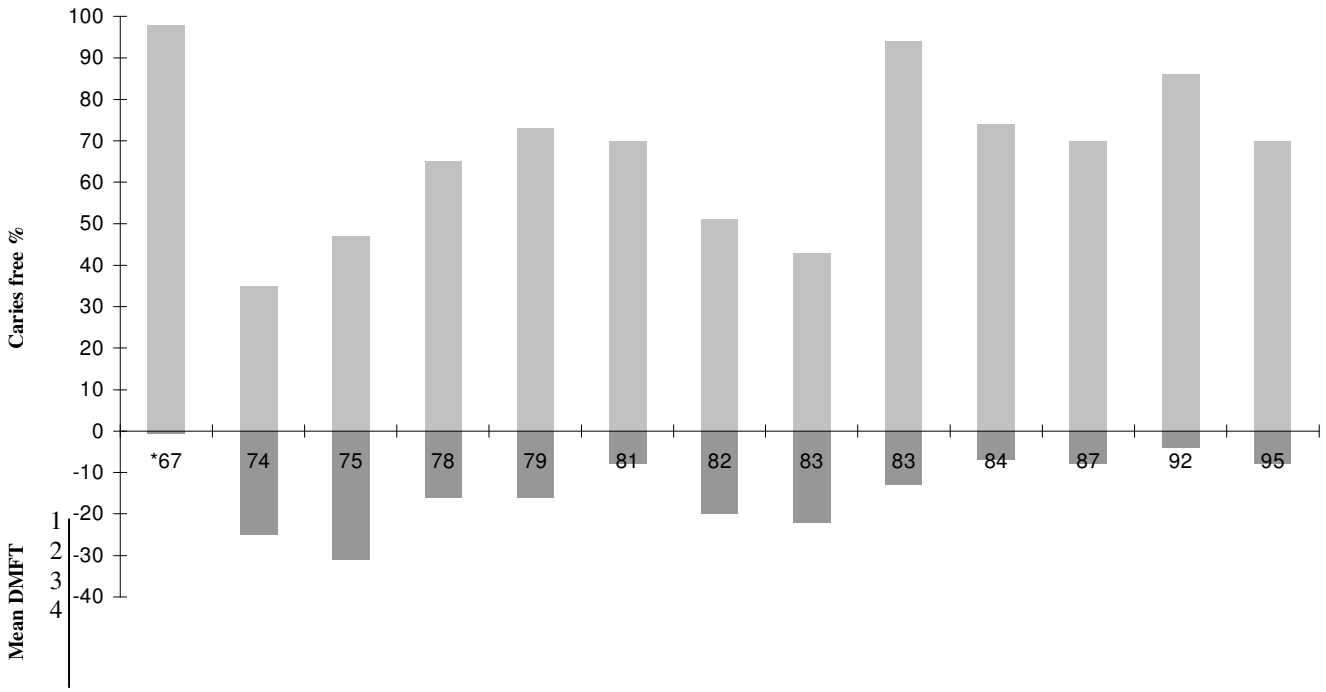
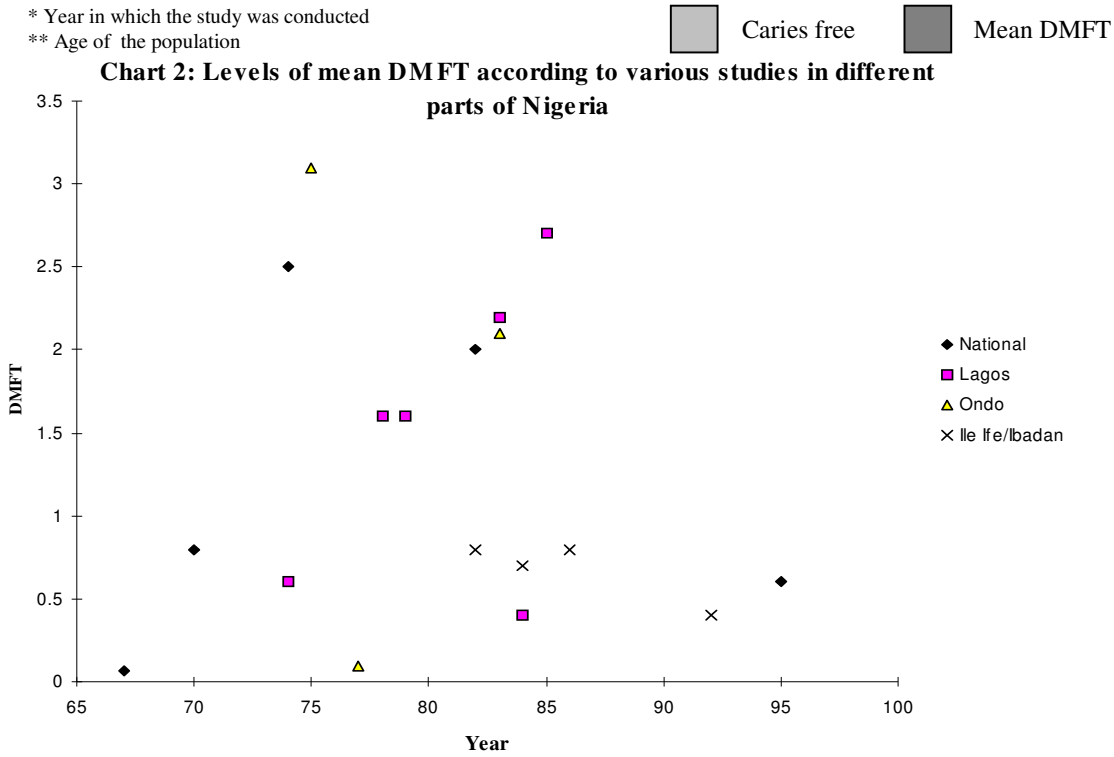


Fig 4: The mean DMFT in different surveys in the different locations in Nigeria.



Discussion

Caries experience has been previously very low in Nigeria[27]. It has been suggested that the increase in the consumption of sweet drinks and food in Nigeria combined with poor oral hygiene might lead to a higher level of caries[34,44]. Furthermore as a result of changes in the society an increase might be expected[45]. Surprisingly, our findings in central Nigeria agree to a great extend with those of the year 1967[27]. The data collected indicated that there was very low caries prevalence in and around Jos. The mean DMFT was as low as 0.27 and 85% of the children were caries free. Periodontal conditions were also not a major oral health problem in central Nigeria. In the early epidemiological surveys on periodontal conditions, any deviation from the ideal was recorded and considered as disease[1]. The CPITN index which was used to examine these children showed that many of them included in the baseline study had high prevalence of gingivitis and calculus. At these age groups however, there were very few sites with shallow pockets and none with deep pockets. The traditional concept on the progression of chronic inflammation has changed. The high prevalence of plaque, calculus and gingivitis at a young age does not necessary lead to severe periodontal breakdown with ultimately tooth loss in old age[46]. The epidemiological studies also indicate that periodontal disease is not as prevalent as it was before[1].

In Enugu state, Nigeria in 1996 half of the subjects (12-18 years) had bleeding, one third had calculus and only two subjects had shallow pockets[24]. This is in confirmatory with data from the present study and with the other studies from Nigeria[22,47] and from Tanzania[48] and Gambia[49]. However, some studies (GODB) have shown that almost half of the subjects (15-19 years) in Nigeria had shallow pockets[16]. Of course differences in pressure of probing, lighting conditions, sampling methods, training and the experience of the examiners might have caused variations in the results. What impact these variations have in planning is another issue. However, in the case of juvenile periodontitis, code 1 CPITN (bleeding) that denotes the presence of inflammation, has no clear correlation with active loss of attachment[18]. Codes 3 & 4 which denote the presence and depth of pockets are important tools for the differential diagnosis of JP especially in the absence of X rays. Therefore, despite the low prevalence of JP in Nigeria (0.075-0.8%), and the differences in the measurement and the occurrence of deep pockets at the age of 15-19 years, attention should be given as some of them may require immediate care.

It was thought that periodontal disease and dental caries constitute 90% of the causes of tooth loss in Nigeria and periodontal disease superseded caries as a major cause of tooth loss[50]. These findings are in agreement with those of similar studies by Okoisor[51]. Moreover, tooth loss among the Nigerian elderly subjects (mean age 68.7 years) was found to be largely due to periodontal disease[52], but it seemed to result in loss of several teeth only by a few individuals[53]. Generally, periodontal disease superseded dental caries as a cause of tooth loss only in few studies[54]. Reports from Tanzania indicated that tooth loss because of periodontal disease was an infrequent finding even in older age categories[55,56]. The high prevalence which has been observed in Nigeria in

several studies[6,13,14,57] is dependent on how the disease is defined and age group from which they were taken. In general, however Nigerians have good periodontal conditions especially in central Nigeria. This does not exclude the fact that, oral hygiene should be improved. Oral hygiene has been found generally poor in the lowest strata of the community that suffers more from periodontal disease[4]. This might explain the differences we found between urban and rural areas in the numbers of children affected by shallow pockets. Moreover, the prevalence may vary from one region to another and between the different socio economic groups[58,59].

Our review of caries studies covers a period of 32 years. Almost all studies involved specific age groups. Only the surveys by Sheiham[27] (1967), Akpabio *et al.*[20] (1983) and Adegbembo *et al.*[43] (1995) involved children of various ages. In general caries prevalence in these groups was low. The highest mean DMFT scores were reported by Henshaw[31] in 1975, and Arain and Arole[39] in 1985 (3.1 & 2.7) and observed in Ondo and Lagos among subjects aged 10-19 and 15-17 years respectively. The second highest DMFT scores were reported by the same authors (2.6 for different parts of Nigeria & 2.2 for Lagos). These studies had the highest caries prevalence estimates and suggest a declining prevalence of dental caries. However, differences in sampling technique, criteria for diagnosis of dental caries and segments of the Nigerian population studied may result in artificial trend [42, 60, 61]. For example studies by Henshaw[29] and Henshaw and Adenubi[31] obtained their sample from schoolchildren, from the patients attending dental centres for treatment and from the village communities. The extent of the sampling bias cannot be ascertained. Studies conducted prior to 1970 diagnosed dental caries when there were obvious cavitations, whereas the later studies used a dental probe to elicit the presence of a cavity. These visual-tactile examinations could have well over- estimated the prevalence of caries when compared to those studies with only the visual screening. All other studies have reported lower DMFT scores and from the period between 1984 to 1995 the results showed some stabilisation and differences in the mean scores were very small.

So far two reports presented changes in caries prevalence over a five-year period. Olojugba and Lennon (1987) obtained increase of the prevalence from 63 to 80 percent for 12-year -old schoolchildren from different social classes in Ondo state. On the other hand, Kubota *et al.* (1990) obtained slight increase of the prevalence of dental caries in Ile Ife among the urban dwellers. However, the rural dwellers had a significant decline in dental caries prevalence over the study period (1981-1986). Olojugba and Lennon (1987) explained the increase in the mean DMFT (from 0.1 to 2.1) by the major political, social and economic changes in Ondo state. The reports since 1966 have indicated that the prevalence of dental caries is increasing particularly among city dwellers[2,6,20,31,62]. However, Olojugba and Lennon did not observe any significant differences in the mean DMFT scores between different social classes neither in 1977 nor in 1983. Also the present study did not show any significant differences between rural and urban areas or socioeconomic classes. This does seem to be sustained by the results from the last national survey which showed that rural and urban differences are not consistent in all ages[43]. This may indicate an on-going change in the pattern of distribution of caries in Nigeria.

Very low or zero caries prevalence does not allow for a measurement indicative of whether the oral health situation is highly stable, near instability or near a massive outburst of caries[63]. Nevertheless, in the case of Nigeria some data are available. During the 60s almost all the people examined were caries free. After the 70s reports showed a different trend. Only 82% were caries free and the most recent national survey indicated that only 70% of the children were caries free. The message emerging from these studies is that the proportion of children who are caries free has continued to decline in Nigeria. Consequently, even if there are cities with very low caries, as long as the number of caries free children is declining then the situation could be considered as deteriorating. In the current study there was an increase in caries level from age of 11 to 12. At the age of 13 years the percentage of caries free children increased and thereafter it showed a slight decline again. This is in an agreement with the previous study conducted in Benin where the number of caries free children was very high particularly at 13 and 14 years of age[36]. A possible explanation for this is attrition[64, 65]. According to the present findings we should then expect that the attrition happened within one year or from age 12-13 which is unlikely to be the case for all the children. Another possibility is that there is an element in the environment that helps in the healing the carious lesions. There has been presented a hypothesis which indicates the ability of stannous fluoride containing solutions or materials[66] to demineralise carious dentine. The mode of action of these compounds is unclear. However, tin may mediate by direct occlusion of the dentinal tubules[67]. Plateau state owes its frame partly to its abundant tin deposits and it is famous for its mineral resources and salt. Usually young children try to sieve tin from water. What impacts have such environments in caries prevalence is not known and should be investigated further.

Deteriorating dental health is seen as an unavoidable consequence of an economic growth because a change to a more refined high-sugar diet is associated with the economic growth. However, the role of the urbanization in economic development of developing countries is debatable[68,69]. Unlike the first urban revolution which was historically restricted to the industrialized countries, where urbanization was preceded by the changes in the structure and the technology of agricultural production, the second urban revolution, which is world wide, is characterised by a rapid population growth in the urban centres of developing countries without the preceding transformation of production[69]. However, the negative impact of the urbanization on health and the environment has been reported[70,71]. Jos has one of the largest factories in Nigeria for producing sweets, biscuits and fizzy drinks, but this did not seem to have an effect on the level of caries the children had.

Currently available studies are fraught with limitations and do not allow for the development of coherent synthesis or understanding. However, they throw doubt on the view expressed by many authors and may indicate that many of the sampling procedures used in the previous studies are compromised. Despite of all the imperfections of data comparison which involves multiple uncalibrated examiners and different collection dates, it could be suggested that at a national level the magnitude of caries increase is debatable. There is a

definite increase in caries prevalence in Lagos and it's neighbouring state Ondo. This situation is different in the central Nigeria where the caries level has remained low for the last 30 years. Therefore this paper questions some fundamentally held beliefs on disease levels in the developing countries. Present evidence seems to indicate that there is a tendency of the future increase in caries experience of 12-15-year-olds in some parts of the country (Lagos and Ondo States).

Acknowledgement
We gratefully acknowledge the co-operation of Dr. A O Adegbembo and Dr. P Carlsson, Malmö Dental School, University of Lund, Sweden. We are also very grateful to Mrs. J Sardo Infirri, WHO/ORH, Geneva, for her continuous support of the research carried out by the Centre.

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