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The oral health and treatment needs of schoolchildren in Trinidad and Tobago: findings of a national survey

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Summary. *Objective.* To describe the oral health and treatment need of schoolchildren in Trinidad and Tobago.

Design and method. Cross-sectional survey using stratified cluster sampling. Participants were children in primary (aged 6–8 years) and secondary school (aged 12 and 15 years). Main outcome measures were DMFT/dmft, treatment need, and fluorosis.

Results. Examinations were completed on 1064 children. The dmft of the 6–8-year-olds was 2·54 (95% CI = 2·32, 2·76). For 12-year-olds, the DMFT was 0·61 (95% CI = 0·51, 0·71), whereas for 15-year-olds, the DMFT was 1·06 (95% CI = 0·87, 1·25). Most of the caries experience in 6–8-year-olds was from decayed teeth. Sixty-seven per cent of the sample (95% CI = 64%, 69%) had some type of treatment need. Most frequently occurring need was for fillings at 42% (95% CI = 40%, 44%) with 28% (95% CI = 26%, 31%) of the total sample needing two or more surface fillings, followed by fissure sealants at 33% (95% CI = 30%, 36%) and caries-arresting care at 12% (95% CI = 10%, 14%). Extraction of one or more teeth was needed in 13% (95% CI = 11%, 15%) of children. Rates of fluorosis were negligible.

Conclusion. The caries experience of 12- and 15-year-old children were low but was high for schoolchildren aged 6–8 years, in terms of prevalence and severity. Effective oral health promotion strategies need to be implemented to improve the oral health of primary schoolchildren in Trinidad and Tobago.

Introduction

The World Health Organization (WHO) recommends that for the planning of dental services, surveys of oral health be used to collect information about oral disease, oral health, and treatment needs of a population, and to monitor changes in levels and patterns of these variables over time [1]. It is suggested that these surveys be conducted in children aged 6–8 years, 12 years, and 15 years [1].

Monitoring of health is also important because dental caries occurring during childhood can often result in pain and abscess necessitating urgent dental treatment such as fillings or extraction of teeth (both of which may be traumatic for young children). Although its prevalence among children is decreasing in the developed world, there has been a trend of increasing caries prevalence among some developing nations [2,3].

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The WHO adopted in its World Health Assembly in May 1981, as a global indicator for the oral health status of children, an average of not more than three decayed, missing, or filled permanent teeth at the age of 12 years, by the year 2000 (i.e., DMFT = 3·0) [4]. More recently, the WHO has embarked on producing oral health goals for 2020. For these goals, no absolute values have been given, as these have to be established on the basis of local priorities and oral health systems, as well as disease prevalence and severity and socioenvironmental conditions [5]. Most developed nations have met or greatly exceeded the goal of DMFT 3 and data from oral health surveys undertaken in the English-speaking Caribbean show that many of these countries have also met this target [6].

The report of the last national child dental health survey in Trinidad and Tobago, which was conducted in 1989, indicated that the DMFT of 12-year-olds was 4·62 (DT 4·25, MT 0·08, FT 0·28) with 86% of these children having experienced caries [7], indicating a high prevalence and high severity of disease at that time.

The aims of this study were (1) to describe the caries experience, treatment need and levels of fluorosis of primary schoolchildren aged 6–8 years, and secondary schoolchildren aged 12 and 15 years in Trinidad and Tobago; and (2) to provide baseline data at national and regional level to enable planning of dental services in Trinidad and Tobago.

Method

Setting

Trinidad and Tobago is a twin-island democratic republic near the north-east coast of Venezuela in the Caribbean Sea. It has a total area of 5128 km^2, of which Trinidad covers 4828 km^2. Twenty-three per cent of the 1·3 million population are under 15 years of age, and one-quarter of the population live in rural areas [8].

In 1994, the country was divided into four Regional Health Authorities (RHAs) that were given responsibility for the delivery of health care to their local populations.

Dentistry in Trinidad and Tobago falls under the Dental Profession's Act first passed in 1980 and amended in 1998, with a Dental Council charged with regulation of the profession [9]. The number of registered dentists in Trinidad and Tobago is 273, of these only 15 work in the public sector, the majority being solely in private practice. The Act also recognizes dental nurses. These dental auxiliaries work in health centres under the supervision of a dentist and can provide preventive and restorative care and exodontia for children up to the age of 12 years. There are 46 registered dental nurses working in the government sector.

Trinidad and Tobago is also divided into county regions with respect to local administration. The counties and their corresponding health authorities are described in Table 1, along with unemployment data and number of government dental clinics.

Ethical approval for the study was gained from the Pan American Health Organization (PAHO). Permission for the survey was obtained from the Trinidad and Tobago Ministries of Health and Education. Consent for individual dental exams was obtained from parents using returned consent forms that were distributed at schools through liaison with head teachers.

Sample selection

The study comprised three groups of children: aged 6–8 years, 12 years, and 15 years. In order to select the children for the study, a stratified cluster sampling methodology was used. The sampling frame comprised primary (for children aged 6–8 years) and secondary (for children aged 12 and 15 years) schools. Before selection, schools were stratified by the Regional Health Authority (RHA). This was not only to facilitate the sampling process but also because it was intended that each RHA would use the study results to inform their programme planning. Within each RHA (stratum), systematic random sampling was used to select the schools using probability proportional to their estimated size.

Table 1. County regions in Trinidad and Tobago with corresponding health authorities, unemployment data, and number of government dental clinics*.

County regions	Corresponding health authority	Proportion labour force unemployed	Government dental clinics
St. George	North-west	12·2%	18
Caroni	North-west	10·2%	6
Victoria	South-west	13%	6
St. Patrick	South-west	17·7%	6
St. Andrew	East	10·7%	6
Tobago	Tobago	8·8%	8

*Central Statistics Office. Census 2000. Port of Spain: Trinidad and Tobago Ministry of Integrated Planning and Development, 2000.

After stratifying by RHA and school type (primary or secondary), a total of 37 schools were randomly selected for the study. There were nine schools each from the north-west, eastern, and Tobago RHAs and 10 from the south-west RHA. Overall, there were 18 primary and 19 secondary schools. When a school was selected, all children of the required age were given consent forms to take home to their parents explaining the nature of the survey and inviting them to give permission for their children to participate. Only children who had returned the signed consent forms qualified to be examined.

The results of the 1989 dental survey conducted in Trinidad and Tobago indicated that 64%, 80%, and 89% of children aged 6, 12, and 15 years old, respectively, needed various forms of treatment. These data were used as estimates in determining the minimum sample size needed for each age group within the RHAs. To give a precision rate of 7% (P = 0·05), the total sample size needed was 1429 children. This included 669 6–8-year-olds, 463 12-year-olds, and 297 15-year-olds.

Variables and measurements

Background and demographic data were collected on the children's age, gender, school, and Health Authority Region where their schools were located. Oral health variables included: dental caries experience, treatment need, treatment urgency, and fluorosis. Measurement and recording of these variables were based on WHO criteria[1]. For measurement of fluorosis, only permanent maxillary anterior teeth were included. Treatment need categories included: 'one surface filling', 'two or more surface fillings', 'fissure sealants', 'preventive care' (i.e., fluoride treatment), and 'extraction of one or more teeth and crown for any reason'.

The oral examinations were undertaken by six trained and calibrated examiners, who along with their recorders and assistants, operated as three teams (two in Trinidad and one in Tobago). Examinations were conducted using dental mouth-mirrors and Community Periodontal Index of Treatment Needs (CPITN) explorers and conducted with the child in a supine position using head-mounted examination lights. Teeth were examined without drying. Data collection took place between March and April 2004.

Training and calibration

Training of examiners ensured consistency in examination techniques and interpretation of criteria for all dental indices to be used. Calibration of examiners ensured reliability of recorded data. Calibration of examiners was undertaken by a Pan American Health Organisation (PAHO) consultant oral epidemiologist over a 5-day period at the University of the West Indies School of Dentistry and at one local school that was not included in the survey sample.

Reliability of data was not only assessed before data collection began but also in 10% of the survey participants. Duplicate measurements were taken on these children so that both intra- and interexaminer reliability could be determined.

Data and analysis

The data were summarized and described using relative frequencies and percentages for categorical variables (such as the presence of decayed teeth) and means for the interval scaled variables (such as the DMFT score). Ninety-five per cent confidence intervals (CI) were calculated for all the principal outcome variables. When the outcome variables were categorical, chi-squared tests were used to examine differences by gender, Regional Health Authority, and age group for statistical significance. Because the interval scale variables were not normally distributed, differences in means were examined using the Mann–Whitney U and the Kruskal–Wallis tests. Cohen's Kappa was used to measure the intra- and inter-observer reliability of the examiners. The Kappa statistics were calculated to measure the level of agreement in duplicate assessments of the status of each tooth. Data were analysed using SPSS version 11·0 (SPSS Inc., Chicago, IL, USA) for Windows. Statistical significance was conservatively set at $P < 0{\cdot}01$ because of the large number of statistical tests conducted.

Results

Response rate and demographics

A total of 3783 schoolchildren in the selected schools met the selection criteria and were given consent forms to take home for their parents to allow their participation in the study. Of these, 1736 (46%) children returned their forms indicating that they had permission to be examined. Overall, of the children whose parents had given consent, 1604 (92%) were included in the study. The sample size achieved in this survey (1604) therefore exceeded the statistically required number (1429). More than half the samples were girls (55%).

Examiner reliability

The results indicated that examiner reliability was very good. Kappa values ranged from 0·97 to 1·0 for interreliability and from 0·93 to 1·0 for intraexaminer reliability.

Caries experience

Overall, 38% (CI = 32–45%) of 6-year-olds were caries free (i.e., had no decayed, missing, or filled teeth). Two-thirds of children aged 12 years or 66% (95% CI = 58–73%) and over half, or 55% (CI = 45–66%) of the 15-year-olds were caries free.

The proportion of children (by age and RHA) in each of the categories of the DMFT/dmft, is shown in

Table 2. Proportion of children with decayed, missing, and filled teeth by age and RHA ($N = 1604$).

Age group (N)	Tooth status	Regional health authority (RHA)								
		North-west		South-west		Eastern		Tobago		
		n	%	n	%	n	%	n	%	P value*
6–8 years (788)		($n = 194$)		($n = 221$)		($n = 220$)		($n = 153$)		
	Decayed	106	55	131	60	143	65	92	60	0·22
	Missing	31	16	29	16	49	22	18	12	0·02
	Filled	1	0·5	7	3	3	1	18	12	< 0·001
12 years (488)		($n = 145$)		($n = 117$)		($n = 119$)		($n = 107$)		
	Decayed	26	18	46	39	24	20	28	26	< 0·001
	Missing	10	7	9	7	9	8	1	1	0·10
	Filled	14	10	4	3	7	6	9	8	0·22
15 years (328)		($n = 101$)		($n = 64$)		($n = 89$)		($n = 74$)		
	Decayed	21	21	31	48	30	34	24	32	0·003
	Missing	6	6	5	8	4	5	11	15	0·08
	Filled	18	18	4	6	7	8	14	19	0·03

*χ^2

Table 3. Caries experience by age group ($N = 1604$).

Age group (N)	DT/dt Mean (SD)	MT/mt Mean (SD)	FT/ft Mean (SD)	DMFT/dmft Mean (SD)
6–8 (788)	2·19 (2·82)	0·28 (0·78)	0·07 (0·45)	2·54 (3·12)
12 (488)	0·43 (0·92)	0·07 (0·29)	0·11 (0·47)	0·61 (1·15)
15 (328)	0·67 (1·37)	0·10 (0·39)	0·29 (0·91)	1·06 (1·79)

Table 2. For each of the age groups, the proportions with DT, MT, and FT were similar for boys and girls. Comparison between the four RHAs showed significant differences for several of the categories of the dmft/DMFT. The proportion of 6–8-year-olds with filled teeth in Tobago [12%] was much higher than those in other regions. For 12-year-olds and 15-year-olds, the greatest proportion with decayed teeth was from the south-west region (39% and 48%, respectively). The north-west region had the lowest proportion of children with decayed teeth among 15-year-olds.

The caries experience (mean DMFT/dmft) of the whole sample is described in Table 3. Six- to 8-year-olds had the highest caries experience 2·54 (95% CI = 2·32, 2·76). Most of the caries experience in 6–8-year-olds was from decayed teeth (dt). In the permanent dentition, 12-year-old children had a much lower caries experience of 0·61 (95% CI = 0·51, 0·71) than 15-year-olds with 1·06 (95% CI = 0·87, 1·25). The proportion of children with three or more decayed teeth in the 6–8, 12, and 15 years age groups were 33%, 4%, and 8%, respectively.

Treatment need

Overall, 67% (95% CI = 64%, 69%) of the sample had some type of treatment need. The most frequently occurring need was for fillings with 42% (95% CI = 40%, 44%). This includes 28% (95% CI = 26%, 31%) of the total sample needing 'two or more surface fillings'. The next most frequent need was for 'fissure sealants' at 33% (95% CI = 30%, 36%) and 'fluoride treatment' at 12% (95% CI = 10%, 14%). 'Extraction of one or more teeth' was necessary in 13% (95% CI = 11–15%) of the children.

Treatment need by age and RHA is shown in Table 4. Significant differences were found across the regions for treatment need. For 6–8-year-olds, the largest proportion of need was in the categories for fillings. This age group also had the highest need for 'extraction of one or more teeth'. In the older age groups, the greatest need was for 'fissure sealants'. Children in the south-west region had more need for 'extraction of one or more teeth' (16%) and 'one surface fillings' (31%). Tobago had more need for 'fluoride treatment' (38%) and 'fissure sealants' (64%), than the other regions.

Need for urgent care and referral

There were no reported life-threatening conditions in any of the children examined. Pain, however, was present in 6%, whereas (2%) had an infection. There were no gender differences in the need for care because of pain.

Table 4. Treatment need by age and Regional Health Authority.

	Regional health authority									Age						
	NW		SW		Eastern		Tobago			6–8 years		12 years		15 years		
	n	%	*n*	%	*n*	%	*n*	%	*P*-value	*n*	%	*n*	%	*n*	%	*P*-value*
Any type of treatment needs	247	56	268	67	269	63	282	84	< 0·001	564	72	290	59	212	65	< 0·001
Types of Needs																
One surface filling	89	20	123	31	105	24	87	26	0·007	225	29	98	20	81	25	0·003
Two or more surface fillings	104	24	117	29	142	33	97	29	0·02	364	46	51	11	45	14	< 0·001
Fissure sealants	140	32	136	34	122	28	213	64	< 0·001	228	29	213	44	171	52	< 0·001
Fluoride treatment	16	4	75	19	35	8	126	38	< 0·001	195	25	29	6	28	9	< 0·001
Extraction of one or more teeth	38	9	65	16	61	14	34	10	0·003	143	18	32	6	23	7	< 0·001
Crown for any reason	13	3	4	1	9	2	1	0·3	0·02	9	1	11	2	7	2	0·25

*χ^2

Fluorosis

There were very little signs of fluorosis. Among 12-year-olds, 97% were normal and 3% questionable. Among 15-year-olds, 97% were normal and 3% questionable. Regionally, Tobago showed a slightly higher prevalence of fluorosis where 89% were normal compared with 96% in the north-west, and 98% and 97% in the south-west and east, respectively.

Discussion

The findings from this survey reveal a remarkable improvement in the oral health of 12-year-old schoolchildren in Trinidad and Tobago over the last 15 years. The present DMFT of 0·6 has greatly exceeded the WHO goal of 3 by the year 2000. This is similar to the situation in several other Caribbean countries. The change in DMFT of 4·62 in 1989 to 0·6 in 2004 (DT reduced from 4·25 to 0·43), is particularly striking as no official public health intervention was made during that time.

We can therefore only speculate as to the cause of the improvement in Trinidad and Tobago. There were significant methodological differences between the 1989 and 2004 surveys. Differences included sample selection, the fact that in 1989 examinations were conducted in dental clinics at health centres near the schools, calibration was not conducted in the field, and sharp probes used to examine teeth compared with visual diagnosis in 2004. These factors alone, however, are unlikely to explain the differences observed in DMFT.

Another factor involved in the apparent improvement in oral health may have been selection bias, as it is possible that the sample included more children with lower caries experience because of the tendency for people with better health to volunteer to participate in health surveys [10].

The introduction of fluoridated salt in Jamaica in the mid-1980s has been credited with the 80% reduction in DMFT in that island by the mid-1990s [11]. Salt fluoridation forms part of PAHO's oral health strategy for the Caribbean [12]. Undoubtedly, fluoridated salt has made its way to Trinidad as part of the normal trade in the Caribbean and may have been purchased by consumers here both knowingly or unknowingly. Unpublished data, however, from an investigation of fluoride content in 14 brands of salt available in Trinidad, undertaken by the Department of Analytical Chemistry at the University of the West Indies found only one brand with the recommended 250 ppm required for caries prevention. Interestingly, fluorosis levels among 12- and 15-year-olds were negligible in all the regions in this study.

It is likely that a large part of the improvement has been a result of an overall increasing awareness of dental health and health care by the public, which may have included use of fluoride toothpaste and dental visits by children. Oral health promotion to schoolchildren is also one of the stipulated duties of dental nurses in Trinidad and Tobago and interestingly was regarded by them as one of the most rewarding aspects of their job [13].

Of major concern, however, is the relatively high caries prevalence and severity of 6–8-year-olds. The majority of their caries experience was from decayed teeth (one-third had three or more decayed teeth), which suggests that children in this age group were less likely to receive restorative care. Furthermore, a recent study conducted at the UWI School

of Dentistry on paediatric dental emergencies found that most of the presenting children were in the mixed dentition and had pain as a result of decay and infection in the primary molars [14].

Treatment need for 6–8-year-olds was high with almost one-half requiring fillings and almost a fifth needing extraction. In the 12- and 15-year-olds, treatment needs were mainly for fillings and fissures sealants with a very small proportion needing extraction or crowns.

The lower levels of treatment need in the north-west may be because of greater access to government dental services compared to other regions. In the south-west, a more rural part of the island with fewer dental clinics, treatment needs were significantly higher with more children needing fillings and extractions. This may also be related to the higher unemployment levels in the south-west (serving as a proxy measure for deprivation level), as higher dental caries levels are associated with lower socioeconomic status [15].

Addressing the high level of caries experience of primary school children in Trinidad and Tobago will require increased oral health promotion for parents and caregivers both at primary school age and at the preschool stage to enable them to implement effective preventive regimes for their children. Dental health education should include information/guidance on reducing the frequency of sugary foods and drinks in the diet, good oral hygiene, use of fluoride toothpaste, and early attendance at the dentist or dental nurse for advise and care. Improving access to dental care and encouraging uptake of dental services should also form part of any health promotion strategy for primary school children.

The main limitation of the survey was the low return rate of signed consent forms by the children (46%). This low return rate may have been related to indifference or a lack of understanding of the importance of the study by some children and/or their parents. This was compounded by the time frame for the data collection, which restricted the ability of the researchers to work more closely with the parents to increase their level of engagement in the study. These factors, however, are not expected to be associated with the oral health of the children and therefore are unlikely to result in any bias in the results. Indeed, the sample size was adequate for the purposes of the study. The sample measured is therefore likely to be representative of schoolchildren of the same age.

The sampling strategy was based on identifying children attending schools. This meant that other children (those not attending school) were omitted for the survey. As school attendance is compulsory up to age 12 years in Trinidad and Tobago, this was not a problem for the 6–8 years and 12 years age groups.

In conclusion, the 2004 national survey of the oral health of schoolchildren has shown a tremendous improvement with respect to the caries experience of 12-year-old children, compared with the last survey of 1989. The oral health of 15-year-old children was also found to be good. Caries experience in primary schoolchildren aged 6–8 years was found to be high in terms of prevalence and severity. Untreated decay in this age group was also common. Effective oral health promotion strategies need to be implemented to improve the oral health of primary schoolchildren. The oral health of secondary schoolchildren should also be addressed and carefully monitored to maintain the reported improvements.

What this paper adds

- Shows evidence of improvements in oral health of secondary schoolchildren in Trinidad and Tobago, a developing country, despite no formal public health intervention.
- Highlights poor oral health in primary schoolchildren, which may be related to access to care.

Why this paper is important to paediatric dentists

- Creates awareness of oral health issues affecting children in the English-speaking Caribbean.

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