Oral Health Survey
Anguilla, British West Indies
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Background

 The dental department of the Health Authority of Anguilla is committed to optimize oral health of the population of Anguilla. Dental health services are provided by professional staff from the dental department which is conformed by the senior dental officer, one dental surgeon, three dental therapists, one dental surgery assistant and a receptionist. The team provides services at the dental unit in the Valley, the dental clinic at the Welches Polyclinic and in a mobile dental unit that rotates through selected schools. Fluoride supplements were given to children in primary schools between 1989 and 1998 when the program was discontinued. Curative care is provided to children and adults in the three dental clinics, and while oral health promotion activities have been recently increased, the need for strengthening preventive strategies has been identified a priority within the strategic corporate plan for 2005 prepared by the dental department. Staff from the dental department conducted a preschool screening for dental disease and a plaque and debris survey of 7 (n=112) and 8 (n=90) year-olds that corresponded to approximately 50% of the total enrollment in each age group. Scores 0 to 3 were assigned to indicate absence or presence of plaque in a rating scale being 3 the most evident. Results indicated plaque presence (score of 1) in 59% of 7 year-olds and 49% in 8 year-olds. Moderate plaque presence was evident in approximately one third of children in both age groups which would suggest the need to emphasize oral hygiene in both groups. According to the World Health Organization (WHO) global data bank[1] the DMFT at 12 years of age in Anguilla was 5.6 in 1978 and 2.5 in 1991. No further information was available as regards to number of children examined and other survey details. In 2000 a survey was conducted to assess early childhood caries in children less than five years of age[2]. A total of 523 children representing approximately 63% of the existing children of that age were examined by one dental examiner. Criteria for assessing early childhood caries (ECC) were that established by the National Institute of Dental and Craniofacial Research (NDICR). Prevalence in cavitated lesions was 37% which increased to 50% when non-cavitated lesions were included. The severity of dmfs was 3.72 ± 8.80 and increased to 4.71 ± 9.32 when non-cavitated lesions were included. Overall mean dmft was 1.67 ± 3.22. The overall prevalence of ECC in Anguilla according to this study was high (50%). Plaque was found in 27% of the subjects. Approximately 38% of the children required dental treatment but more than half of the children in each age group did not require treatment.

Current data on oral health status of children was insufficient for deciding the most suitable public health approach. Thus, need for updating data on dentition status and treatment needs in young children was deemed as an essential course of action. A complementary study to assess fluoride exposure in children 3-5 years of age was also deemed indispensable to be conducted; the details of such study are described in separate report.

Oral Health Survey Design

The variables selected for the survey were caries prevalence and severity, dental treatment needs, treatment urgency, enamel fluorosis and oral hygiene status as indicated

by bleeding on probing and presence of calculus. The selected age groups were 5-6, 12 and 15 year-old children.

Methodology

Age groups and examination criteria selected for the study were those recommended by the World Health Organization[3]. A simplified data collection instrument[4] was prepared to include fields for collection of demographic information and a modification for recording treatment urgency based on the presence of small cavitated lesions requiring routine dental treatment and the need for dental prophylaxis, the presence of large carious lesions, presence of pain, need for pulpal therapy or presence of abscess.

Sampling

The school system was used as the sample frame for the survey. Table 1 depicts children enrolled in school in 2004.

Table 1
Oral Health Survey, Anguilla 2005
Children enrolled in school in 2004

School	5-6 years	12 years	15 years
Island Harbour Primary	13	9	
Morris Vanterpool Primary	16	14	
Stoney Ground Primary	45	38	
Valley Primary	54	39	
Road Primary	25	25	
Alwyn Allison Primary	16	8	
Central Baptist Christian Primary	14	0	
Teacher Gloria Omululu	10	12	
Albena Lake Hodge Campus A & B	0	189	221
Total	**193**	**334**	**221**

Sampling was selected with probability proportional to size (PPS) design. Using the PPS sampling system five schools enrolling children 5-6 years of age were selected to form three clusters of 20 and one cluster of 40 children. Five schools were selected for sampling one hundred (100) 12 year-olds; Island Harbour and East End Primary were merged to provide a cluster of 25 children, 25 in Stoney Ground and 50 combining Albena Lake Hodge Comprehensive Campus A and B. These Campuses were also combined to select 125 students 15 years of age. Estimated sampling details and the actual number of children examined are illustrated in Table 2.

Table 2
Anguilla Oral Health Survey 2005
Estimated sampling and actual number of children examined

School	5-6 years		12 years		15 years	
	Estimated	Examined	Estimated	Examined	Estimated	Examined
Central Baptist & Gloria Omululu	20	19				
Road Primary	20	18				
Stoney Ground	20	20				
Valley Primary	40	36				
Island Harbour & East End Primary			25	2		
Stoney Ground Primary			25	12		
Albena Lake Hodge A & B			50	82	125	120
Total	100	93	100	96	125	120

Total number of 12 year-old children initially selected differs from those actually examined because initial selection was based on 2004 enrollment and these children advance from primary schools to Albena Lake Hodge Campus in the new academic year. In the 15 year age group actually 133 children were examined but only 120 were 15 years-old at the time of the examination, the remainder had not reached their 15 years birthday.
Although the estimated quota for each age group was not fully met, the difference was not considered significant; the total number of children examined in each age group, 5-6; 12 and 15 years of age responded to 48%; 29% and 54% respectively, which is estimated to provide representative information of the oral health status of children having the same ages.

Calibration of examiners

The survey was conducted during the week of 31 January and 4 February 2005.
Prior to the initiation of the survey a calibration of selected dental examiners was conducted in a school site in? . Procedures for calibration of examiners followed WHO guidelines. A theoretical review of examination procedures, criteria for recording dentition status, enamel fluorosis and dental treatment needed was conducted. Examiners and recorders were present. This exercise was followed by clinical examination of children corresponding to the age groups to be included in the survey. The percentage of agreement and corrected Kappa statistic for prospective examiners obtained during the calibration exercise were calculated. A second exercise to improve consistency on discerning degrees of enamel fluorosis was conducted. The two examiners were considered to have reached a satisfactory level of inter-examiner agreement. The

calibrator participated in the examinations and was available for consultation on specific criteria questions and scores validation. Table 3 summarizes results of calibration of examiners on dental caries, treatment needs and enamel fluorosis.

Table 3
Oral Health Survey Anguilla 2005
Calibration of Examiners

Examiner	Tooth status		Dental Treatment Needs		Enamel Fluorosis Exercise 1	
	% Agreement	Corrected Kappa	% Agreement	Corrected Kappa	% Agreement	Corrected Kappa
2	72.2	0.45	89.3	0.51	100	1.0
3	90.2	0.79	87.9	0.27	91.7	0.82

Survey data management

Clinical examination findings were recorded in a WHO simplified data collection instrument (copy enclosed) and entered into special software program for analysis using SPSS/SAS statistical packages.

Results

The following tables summarize results of dental caries prevalence by age, severity of dental caries in the primary and permanent dentition by sex and age, age specific relative contribution of DMFT components, age specific relative contribution of the DMFT elements among those with DMFT>0 by sex and age specific relative contribution of the dmft elements among those with dmft>0 by sex. Classification of dental caries severity according to the World Health Organization by age and by sex, dental treatment needs indicating the mean number of teeth requiring specific treatment, treatment urgency by age and sex, dental fluorosis by age, age specific calculated using maximum scores and also calculated using the score of less affected from the two most severely affected

TABLE 4
Oral Health Status in Anguilla 2005

A. *Dental caries prevalence by age*

Age	Caries History Primary				Untreated Primary Teeth				Caries History Permanent				Untreated Permanent Teeth			
	No		Yes		No		Yes		No		Yes		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
5-6	44	48.35	47	51.65	47	51.65	44	48.35	86	94.51	5	5.49	88	96.70	3	3.30
12	94	97.92	2	2.08	94	97.92	2	2.08	42	43.75	54	56.75	70	72.92	26	27.08
15	120	100	0	0	120	100	0	0	45	37.50	75	62.50	76	63.33	44	36.67
All	**258**		**9**		**261**		**46**		**173**		**134**		**234**		**207**	

B. *Caries experience by age*

Age	Non-cavitated lesions								Teeth sealed			
	Primary				Permanent				Permanent			
	No		Yes		No		Yes		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
5-6	85	93.41	6	6.59	84	92.31	7	7.69	91	100	0	0
12	96	100.0	0	0	81	84.38	15	15.63	95	98.96	1	1.04
15	120	0	0	0	100	83.33	20	16.67	119	99.17	1	0.83
All	**301**		**6**		**265**		**42**		**305**		**2**	

TABLE 5
Oral Health Status in Anguilla 2005
Dental Caries Severity

A. *Primary Teeth by Age*

Age	Primary Decayed Teeth			Filled Primary			Missing /caries Primary			dmft Primary Dentition		
	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
5-6	91	1.90	3.36	91	0.33	0.96	91	0.38	1.21	91	2.62	3.88
12	96	0.02	0.14	96	0	0	96	0	0	96	0.02	0.14
15	120	0	0	120	0	0	120	0	0	120	0	0
All												

TABLE 6

Oral Health Status in Anguilla 2005
Dental Caries Severity

A. *Permanent Teeth by Age*

Age	Permanent Decayed Teeth			Filled Permanent			Missing /caries Permanent			DMFT Permanent Dentition		
	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
5-6	91	0.03	0.18	91	0.02	0.15	91	0	0	91	0.15	0.44
12	96	0.82	1.82	91	0.99	1.70	91	0.10	0.49	91	1.94	2.60
15	120	1.07	2.27	120	1.42	2.26	120	0.11	0.53	120	2.60	3.22
All												

TABLE 7
Oral Health Status in Anguilla 2005

Dental Caries - Age specific relative contribution of the DMFT elements among those with DMFT>0

All

Age	% Decayed in DMFT			% Missing in DMFT			% Filled in DMFT		
	N	%	Std Dev	N	%	Std Dev	N	%	Std Dev
5-6	5	60.0	54.77	5	0	0	5	40.0	54.77
12	54	41.63	40.80	54	54.35	43.35	54	4.01	13.40
15	75	44.91	41.62	75	3.56	12.42	75	51.52	41.30
All									

Table 8
Age specific relative contribution of the dmft elements among those with dmft>0

All

Age	% Decayed in dmft			% Missing in dmft			% Filled in dmft		
	N	%	Std Dev	N	%	Std Dev	N	%	Std Dev
5-6	47	80.55	30.48	47	8.50	15.49	47	10.94	22.3
12	2	100	0	2	0	0	2	0	0
15	120	0	0	120	0	0	120	0	0
All									

Table 9

Oral Health Status in Anguilla 2005
Dental Caries - WHO Severity by Age

All

Age	WHO Cut-offs Permanent Teeth								WHO Cut-offs Primary Teeth							
	DMFT=0		1 <=DMFT<=3		4 <=DMFT<=6		DMFT>=7		dmft=0		1 <= dmft <=3		4 <= dmft <=6		dmft >=7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
5-6	86	94.51	5	5.49	91	0	91	0	44	48.35	22	24.18	11	12.09	14	15.38
12	42	43.75	32	33.33	17	17.71	5	5.21	94	97.92	2	2.08	96	0	96	0
15	45	37.50	37	30.83	23	19.17	15	12.50	120	100	120	0	120	0	120	0
All																

Table 10
Oral Health Survey Anguilla 2005
CPI, Distribution of Six Index Teeth, By Age

A. 5-6 years

Score	UR Molar		U Central		UL Molar		LL Molar		LL Central		LR Molar	
	N	%	N	%	N	%	N	%	N	%	N	%
0	83	91.21	88	96.70	85	93.41	85	93.41	83	91.21	87	95.60
1	6	6.59	3	3.30	5	5.49	6	6.59	3	3.30	3	3.30
2	2	2.20			1	1.10			5	5.49	1	1.10
All	91		91		91		91		91		91	

B. 12 years

Score	UR Molar		U Central		UL Molar		LL Molar		LL Central		LR Molar	
	N	%	N	%	N	%	N	%	N	%	N	%
0	67	69.79	77	80.21	60	62.50	70	72.92	69	71.88	68	70.83
1	20	20.83	12	12.50	17	17.71	13	13.54	7	7.29	20	20.83
2	9	9.38	7	7.29	19	19.79	13	13.54	20	20.83	8	8.33
All	96		96		96		96		96		96	

C. 15 Years

Score	UR Molar		U Central		UL Molar		LL Molar		LL Central		LR Molar	
	N	%	N	%	N	%	N	%	N	%	N	%
0	90	75	102	85.00	86	71.67	88	73.33	92	76.67	87	72.50
1	18	15	8	6.67	20	16.67	14	11.67	8	6.67	17	14.17
2	12	10	10	8.33	14	11.67	18	15.00	20	16.67	16	13.33
All	120		120		120		120		120		120	

TABLE 11

Oral Health Status in Anguilla, 2005

A. *Treatment Urgency by age*

Age	Urgency of Treatment needed							
	No need		Routine		Prompt		Urgent	
	N	%	N	%	N	%	N	%
5-6	31	34.07	37	40.66	16	17.58	7	7.69
12	19	19.79	66	68.75	7	7.29	4	4.17
15	33	27.50	69	57.50	13	10.83	5	4.17
All	**83**		**172**		**36**		**16**	

Discussion

Data on oral health conditions of the population of Anguilla is scarce. In the publication Health Conditions in the Caribbean, Oral Health section by the Pan American Health Organization (Adewakun, 1997) mention is made to three surveys conducted in 1986, 1989 and 1991 for 12, 15-19 and 12 year-olds respectively. Reduction in mean DMFT scores is reported for Anguilla. The surveys conducted in 1986 (Llewellyn-Jones) and in 1991 (Langmaid, P.) report marked differences of caries severity for twelve year-olds from very high (DMFT 7.5) in 1992 to low (DMFT) 2.5 in 1991. The percentage of caries-free children 12 years of age in 1991 was 32.0%.

Marked differences are also evident in reporting gingival health. In 1986 the percentage of people with inflamed or bleeding gums was 53.9% and 19.1% in 1991. However, deep pockets were reported to be as high as 34% in 1991 and only 2.4% in 1986 when the highest percentage was bleeding (38%). The dentist population ratio reported in 1996 was 1:10,000 and the ratio of auxiliaries 5.5:10,000; operative auxiliaries were 3.3:10,000 and auxiliaries per dentist 5.0:1

As regards fluoride supplementation, salt fluoridation is mentioned as the main vehicle implemented in Jamaica and it is stated that "fluoridated salt manufactured in Jamaica is currently available in several other Caribbean countries" The publication also states that supervised fluoride supplement programs, use of fissure sealants, mouth rinses have been found to have a significant impact on caries prevalence in the region. However, "not all countries have set up adequate control or biological and chemical monitoring systems…"

Results on dental caries history in the primary dentition obtained in the survey conducted in 2005 indicate that slightly over half of the 5-6 year-olds had caries experience in the primary dentition. Few children had erupted permanent molars, therefore caries history in permanent molars is low. Caries history and caries experience in 12 and 15 year-olds in primary teeth is low because they do not have many deciduous teeth at these ages. Although cavitated lesions were not many in primary dentition, in permanent dentition increase to near 20% at 15; this is an indication that these children will develop cavitated lesions unless a preventive measure is instituted; sealants are a good choice as an interim solution.

Caries severity in primary dentition 5-6 children was moderate; however the standard calculated deviation should not be overlooked (3.88); even though severity is moderate, it is known that as children age the severity will increase if no interventions are provided. The same pattern and comment are applicable to progression observed in permanent teeth at age 5-6, 12 and 15. Caries severity results are closer to those found in 1991 and considerably differ from those obtained in 1986. However, not having details available on survey design it is difficult to compare findings between surveys.

The largest contribution to the DMFT components was decayed teeth; however, it should be noted that in over half of the 12 year-olds, the largest contributors was missing due to caries, but in the 15 year olds, the filled component was 41%; that reflects efficiency of dental health services provided to these children. It is important to note that at least in

80% of children the decay teeth was the highest contributor. Of great importance is the fact that some children had a mean DMFT above 3 and a significant number with 6 and even 7.

In reference to oral hygiene the distribution of CPI there seems to indicate t that oral hygiene is deficient that leads to presence of bleeding and calculus. Of high importance is to recognize that bleeding conditions without presence of calculus can be self reversed; meaning that if effective oral hygiene instructions are given and performed by children, conditions will return to normal; however, teeth recorded as having bleeding and calculus need the intervention of an oral health professional to perform the prophylaxis and/or scaling required so that condition will reverse to normal. It would be difficult to compare the 2005 oral hygiene results with those obtained in 1986 and 1991 because of lack of details on design especially the criteria applied. This is critical since it was noticed that in the 1991 survey, probing was conducted for shallow and deep pockets as evidenced by the CPI scores of 3 and 4 reported and which is not recommended by the WHO for examining children of this age group.

Survey results also indicate that more than half of the children needed to be seen in the dental clinic for dental treatment (prophylaxis or restorative). A considerable group needed prompt professional care and slightly less than 10% needed urgent dental care. The number of teeth sealed was negligible and the need to revisit this strategy as an interim solution deserves further consideration.

Enamel fluorosis was negligible. Children exhibiting moderate fluorosis had been born outside the country. No data is available on enamel fluorosis in Anguilla, nor was a condition reported in the surveys of the PAHO publication, consequently no comparison with previous data can be made at this time.

Recommendations

Results of the study confirm the need to strengthen the oral health program by:
1. Explore avenues for preparing and enacting a resolution that requires all salt imported in Anguilla to be fluoridated. This recommendation is based on the knowledge that fluoridated salt is comparable to water fluoridation for prevention of dental caries. Several countries in Europe and the Americas are utilizing salt as a vehicle to provide fluoride to the population. The method has been used for fifty years and has proven to be safe, effective and economical. A Caribbean country, Jamaica instituted the program in 1987 and has been able to reduce caries prevalence by approximately 80% without adverse consequences. Fifteen year-old Anguilla children that were exposed to sources of fluoride when they were younger benefited as indicated by the moderate caries severity; currently there are no fluoride preventive programs formally in place and it is envisioned that young children will develop carious lesions and unnecessarily suffer from a preventable disease.
2. As a short-term solution, children can receive pit and fissure sealants. This procedure is not the least expensive but will certainly contribute to reduce possibility of caries occurrence in surfaces of teeth that are difficult to clean and

maintain clean. Dental Therapists would need to undergo adequate training on current methodology being used for this procedure. This training opportunity can also be utilized to update on innovative community oral health programs and strategies being utilized in other countries that have proven successful for school children.

3. Oral health survey results need to be correlated with the fluoride exposure study being conducted in Anguilla. Fluoride exposure studies need to be conducted periodically to assess levels of fluoride and ascertain that they are below the threshold recommended by the World Health Organization to minimize the occurrence of unsightly fluorosis

4. Further opportunities for Dental Surgeons and Dental Therapists to participate in continuing dental education courses abroad or coordinate bringing speakers with diverse expertise and knowledge on issues that have been identified in need for betterment of oral health services in Anguilla.

5. Coordination for acquisition of necessary elements, instruments and equipment needed to provide services to meet the needs of the population

   6. Coordinate acquisition of educational material and audio-visual aids to strengthen community oral health education. Emphasizing the importance of health promotion and disease prevention, including risk factors that may compromise the intimate relationship between oral health and general health and how systemic disease could affect oral health and vice versa.

7. promote adequate nutrition habits and emphasize importance and relationship to oral health and general health and enact and implement regulations to reduce sugar sources for consumption by children in school settings.

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