

ORAL CLEANLINESS OF 12-13-YEAR-OLD AND 15-YEAR-OLD SCHOOL CHILDREN OF SUNSARI DISTRICT, NEPAL

Robert Yee, BSc, DDS, MSc Dental Public Health
Department of Community and Preventive Dentistry
College of Dentistry, B.P. Koirala Institute of Health Sciences
Director, Oral Health Programme, United Mission to Nepal
Consultant, Oral Health Unit, DoHS, MoH, HMG Nepal.

Jamil David, BDS, MSc Dental Public Health,
Researcher, Faculty of Dentistry
University of Bergen, Norway.

Rajib Khadka BDS, Post Graduate Student
Oral and Maxillofacial Surgery
King George Medical University, Lucknow, India.

Corresponding author: Dr. Robert Yee
C/O Oral Health Programme, United Mission to Nepal
P.O. Box 126, Kathmandu, Nepal, Phone: 977-1-4257612, Email: robyee@wlink.com.np

ABSTRACT

Objectives: To evaluate the oral cleanliness of schoolchildren in the District of Sunsari, Nepal.

Design and method: Multi-stage random sampling oral epidemiological survey conducted by trained examiners using the Simplified Oral Hygiene Index (OHI-S). *Setting:* Surveys were conducted in private and government urban, rural town and rural village schools in 15 Illakas of Sunsari District, Eastern Nepal. *Subjects:* A total 600 12-13-year-old and 600 15-year-old schoolchildren were examined between April and September, 2001. *Outcome measures:* The level of debris and calculus were estimated and scored. The average age-group debris and calculus index scores were combined to obtain the simplified oral hygiene index (OHI-S).

Results: In both age groups, the mean debris, calculus and OHI-S for the index teeth and the mean scores were higher in schoolchildren of government schools than in private boarding schools and the differences in mean OHI-S were statistically significant ($P < 0.005$). 12-13-year-old males and females have comparable mean OHI-S (1.24 and 1.17) and this was not statistically significant. However, the mean OHI-S was higher in males (1.29) compared to females (1.11) in the 15-year-old age group and this was statistically significant ($P < 0.005$). The mean OHI-S for urban 12-13-year-old schoolchildren was 0.98 compared to 1.34 for schoolchildren of rural towns and 1.44 for schoolchildren of rural villages and these differences in mean OHI-S were statistically significant ($P < 0.005$). In the 15-year-old age group, urban schoolchildren had a mean OHI-S score of 1.00 compared to 1.37 for rural towns and 1.43 for rural villages. The variance in the mean OHI-S scores were statistically significant ($P < 0.005$). *Conclusion:* The overall level of cleanliness in the schoolchildren surveyed was good. Schoolchildren attending private boarding schools had better oral hygiene than their counterparts in government schools. Females were cleaner than males. Children of urban schools had the lowest scores followed by schoolchildren from rural towns and then rural villages. When the mean OHI-S scores were compared with the DMFT scores, there was an inverse relationship between oral cleanliness and dental caries. Frequency of sugar consumption and the availability and affordability of fluoridated toothpaste may be more important factors in the development of dental caries than oral cleanliness.

INTRODUCTION

Sunsari district in the Terai region of Eastern Nepal has a total population of 628,405 (males: 315,819; females: 312,586)¹. Life expectancy of this area averages 60.5 years, which is above the national average for Nepal. Adult literacy rate is 45.18% and the per capita income is Rs. 8,130².

Caste system exists with 46 upper castes and 26 lower castes. The prominent castes include Tharus, Muslims, Brahmin Pahadis, Chettris, Rais, Yadavs, Newars and Mushers. Farming is the main occupation of this region.

An emerging health problem amongst the child population in Nepal is dental caries. A series of cross sectional surveys conducted on schoolchildren by the United Mission to Nepal Oral Health Programme between the period of 1999 and 2000 in Central and Western Nepal shows that the caries prevalence and mean dmft score of 5-6-year-olds (n=2,177) was 67% and 3.2 while the caries prevalence and mean DMFT score of 12-13-year-olds (n=3,323) was 41% and 1.1³. A recent District-wide survey of Sunsari reveals that the caries prevalence and mean DMFT score of 12-13-year-olds and 15-year-olds was 24% and 0.49; and 26% and 0.67 respectively⁴.

Very little information is available concerning the oral cleanliness of children and adults on a national and also at the district level. With the trend towards increasing prevalence and severity of dental caries⁵ and a concern for the periodontal health of young adults, information concerning the oral hygiene status of young children would assist in the development of oral health policies, strategic plans, monitoring and surveillance systems for oral health.

AIM OF THE STUDY

Information concerning the oral cleanliness of children is lacking at a district level throughout Nepal. Collection of such data in the District of

Sunsari serves as a baseline to monitor the impact of oral health activities carried out by the College of Dental Surgery at the B.P. Koirala Institute of Health Sciences in Dharan, Sunsari. The aim of this study was to describe and analyse the level of debris and calculus in the permanent dentition of 12-13-year-old and 15-year-old school children in the District of Sunsari.

MATERIALS AND METHOD

Sampling Methodology

Multi-stage random sampling method was used to select the subjects for the survey. The study population was selected from government schools and boarding schools from each of the 15 Illakas in Sunsari. The first stage units were all the government schools and boarding schools from each Illaka. From the two separate lists, one government school and one boarding school were selected at random from each Illaka. When boarding schools were not available in an Illaka, boarding schools were randomly selected from another Illaka. The second stage units were three separate lists of students of the age groups of interest from each of the selected government schools and a similar list compiled from each of the selected boarding schools. The required number of school children in each of the interested age groups was then selected at random by writing the names of all the students on separate pieces of paper, which were then placed in container. For each of the government schools and boarding schools there were three separate draws, one for each age group.

Calculation of Sample Size

The same subjects surveyed in a previously reported study⁴ were examined for debris and calculus prior to examination for dental caries.

In that study the sample size for each age group was calculated using the following formula:

$$\text{Sample size} = p(1-p)/e^2$$

p = prevalence of disease in the population

e = required size of standard error = 0.02

Calculation of the sample size for the 12-13-year-old population was based on the average prevalence of dental caries in the respective populations found in recent surveys conducted by the UMN Oral Health Programme³ and by Petersen, Mohr and Geddes⁶. Sample size for the 15-year-old population was based on the average prevalence of disease in the 12-13-year-old population. It was assumed that the prevalence of dental caries in the 15-year-old population would be similar to that in the 12-13-year-old population. Prevalence (p) used for the calculation of sample size for the both 12-13-year-olds and 15-year-olds was 40%. Calculated sample size for each of the two age groups was 600. From each of the 15 government schools and each of the 15 boarding schools, 20 children from each of the three age groups were randomly selected.

Personnel, Instruments and Examination Procedure

Dental examinations were carried out by two dentists (Dr. Jamil David and Dr. Rajib Khadka) from the B.P. Koirala Institute of Health Sciences College of Dentistry. Children between the age of 12-13 years and at 15 years were examined in school during class hours in an orderly fashion. Students were positioned supine on a bench or table and were examined by the gloved and masked dental examiners using torchlight. All instruments were brought back to the dental college, washed and sterilised in an autoclave. A trained assistant recorded the data on a standardised form.

Training and Calibration of Dental Examiners

Training of the dentists using schoolchildren was accomplished over a two-day period in the B.P. Koirala Institute of Health Sciences prior to the survey. The examiners were trained to use the criteria for debris and calculus outlined in the Simplified Oral Hygiene Index (OHI-S)⁷. Oral debris and calculus was estimated by running the side of an explorer along the tooth surfaces examined. The surfaces and teeth examined were the buccal aspects of the upper first molars (16, 26), the lingual aspects of the lower first molars (36, 46), and the

labial aspects of the upper right (11) and lower left (31) incisors. Procedure for quick selection and screening of the study subjects for entry into the study was also conducted. Inter-examiner and intra-examiner calibration was not feasible for the OHI-S Index.

The survey was completed over six months (April-September, 2001). Consent for the survey was gained through the District Education Officer of Sunsari and the individual head masters of the selected schools.

Data Analysis

Data entry and data analysis was performed with SPSS Version 10.0. Plaque and calculus are graded on a numeric scale from 0 to 3, depending on the severity and extent of the deposits. The debris scores are totalled and divided by the number of surfaces scored for each individual scores, which provided the debris index. The same methods were used to obtain the calculus index. The average age-group debris and calculus index scores were combined to obtain the simplified oral hygiene index (OHI-S). The OHI-S values range from 0 to 6 and the scores are categorized as follows:

Good: score 0.0 to 1.2

Fair: score 1.3 to 3.0

Poor: score 3.1 to 6.0

The mean OHI-S scores were compared and evaluated using the parametric t-test for two independent samples with the level of statistical significance set at $P < 0.05$.

RESULTS

Three hundred and twenty four (324) males and 276 females age 12-13 years and 362 males and 238 females age 15-years were examined in 15 private and 15 government schools located in urban centers, rural towns and rural villages. Private schools are situated mainly in urban settings and rural town settings. Rural towns are situated along paved roads while rural villages are accessed along dirt roads.

Tables 1-6 display the mean debris, calculus, and OHI-S for each of the index teeth as well as the mean score for debris and calculus and the mean OHI-S of the schoolchildren surveyed. The order of the index teeth with the highest total score to the lowest total score was consistent: 46, 36, 26, 16, 31, 11. All mean OHI-S scores were normally distributed. Debris scores were consistently higher

than calculus scores for all index teeth.

In both age groups, the mean debris, calculus and OHI-S for the index teeth and for the mean scores was higher in schoolchildren of government schools than in private boarding schools (Table 1 and Table 2) and the differences in mean OHI-S were statistically significant ($P < 0.005$).

Table 1. Mean debris, calculus and OHI-S score of index teeth of 12-13-year-old schoolchildren in selected government and boarding schools in Sunsari District.

Type of School	No. of School	n	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean score (SE) debris calculus OHI-S
Government	15	300	0.89 0.73 1.62	0.57 0.07 0.64	0.90 0.70 1.60	0.93 0.75 1.68	0.73 0.39 1.12	0.96 0.82 1.78	0.83 (0.01) 0.58 (0.02) 1.41 (0.03)*
Boarding	15	300	0.72 0.42 1.14	0.25 0.01 0.26	0.80 0.54 1.34	0.81 0.49 1.30	0.47 0.20 0.67	0.83 0.50 1.33	0.65 (0.02)* 0.36 (0.03) 1.01 (0.03)*
Total	30	600	0.81 0.58 1.39	0.41 0.04 0.45	0.85 0.62 1.47	0.87 0.62 1.49	0.60 0.30 0.90	0.90 0.66 1.56	0.74 (0.01) 0.47 (0.02) 1.21 (0.02)

* Difference statistically significant ($P < 0.005$).

Table 2. Mean debris, calculus and OHI-S score of index teeth of 15-year-old schoolchildren in selected government and boarding schools in Sunsari District.

Type of School	No. of School	n	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean score (SE) debris calculus OHI-S
Government	15	300	0.85 0.75 1.60	0.51 0.05 0.56	0.87 0.75 1.62	0.91 0.83 1.74	0.63 0.39 1.02	0.90 0.92 1.82	0.78 (0.01) 0.62 (0.02) 1.39 (0.03)*
Boarding	15	300	0.66 0.46 1.12	0.27 0.04 0.31	0.77 0.59 1.36	0.85 0.52 1.37	0.49 0.29 0.78	0.85 0.48 1.33	0.65 (0.02)* 0.04 (0.02) 1.04 (0.03)*
Total	30	600	0.76 0.61 1.37	0.39 0.04 0.43	0.82 0.67 1.49	0.88 0.68 1.56	0.56 0.34 0.90	0.88 0.70 1.58	0.71 (0.01) 0.51 (0.02) 1.22 (0.02)

* Difference statistically significant ($P < 0.005$).

12-13-year-old males and females have comparable mean OHI-S (1.24 and 1.17) and this was not statistically significant (Table 3). However, the mean

OHI-S was higher in males (1.29) compared to females (1.11) in the 15-year-old age group and this was statistically significant ($P < 0.005$) (Table 4).

Table 3. Mean debris, calculus and OHI-S score of index teeth of 12-13-year-old schoolchildren according to gender.

Gender	n %	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean score (SE) debris calculus OHI-S
Males	324 (54)	0.82	0.45	0.87	0.90	0.64	0.94	0.77 (0.02)
		0.57	0.04	0.60	0.62	0.32	0.66	0.47 (0.02)
		1.99	0.49	1.47	1.52	0.96	1.60	1.24 (0.03)
Females	276 (46)	0.79	0.35	0.82	0.84	0.54	0.85	0.70 (0.02)
		0.58	0.04	0.65	0.62	0.26	0.66	0.47 (0.02)
		1.37	0.39	1.47	1.46	0.80	1.51	1.17 (0.04)
Total	600 (100)	0.81	0.41	0.85	0.87	0.60	0.90	0.74 (0.01)
		0.58	0.04	0.62	0.62	0.30	0.66	0.47 (0.02)
		1.39	0.45	1.49	1.49	0.90	1.56	1.21 (0.02)

Table 4. Mean debris, calculus and OHI-S score of index teeth of 15-year-old schoolchildren according to gender.

Gender	n %	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean score (SE) debris calculus OHI-S
Males	362 (60.3)	0.79	0.43	0.87	0.91	0.60	0.90	0.75 (0.01)
		0.66	0.05	0.76	0.70	0.37	0.71	0.54 (0.02)
		1.45	0.48	1.63	1.61	0.97	1.61	1.29 (0.03)*
Females	238 (39.7)	0.71	0.32	0.73	0.84	0.50	0.85	0.66 (0.02)
		0.53	0.04	0.53	0.65	0.29	0.68	0.45 (0.02)
		1.24	0.36	1.26	1.49	0.79	1.53	1.11 (0.04)*
Total	600 (100)	0.76	0.39	0.82	0.88	0.56	0.88	0.71 (0.01)
		0.61	0.04	0.67	0.68	0.34	0.70	0.51 (0.02)
		1.37	0.43	1.49	1.56	0.90	1.58	1.22 (0.02)

*Difference statically significant ($P < 0.005$).

Results of 12-13-year-old schoolchildren of urban schools, rural towns and rural villages are displayed in Table 5. Children of urban schools had the lowest scores followed by schoolchildren from rural towns and then rural villages. The mean OHI-S for urban schoolchildren was 0.98 compared to 1.34 for schoolchildren of rural towns and 1.44 for schoolchildren of rural villages and these differences

in mean OHI-S were statistically significant ($P < 0.005$). This trend was also evident in the 15-year-old schoolchildren where urban schoolchildren had a mean OHI-S score of 1.00 compared to 1.37 for rural towns and 1.43 for rural villages (Table 6). The variance in the mean OHI-S scores were statistically significant ($P < 0.005$).

Table 5. Mean debris, calculus and OHI-S score of index teeth of 12-13-year-old schoolchildren according to location and type of school.

Location & Type of School	n (%)	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean Score (SE) debris calculus Total
Private urban	260	0.70	0.21	0.79	0.79	0.43	0.82	0.62 (0.02)
		0.39	0.01	0.51	0.43	0.18	0.42	0.32 (0.02)
		1.09	0.22	1.30	1.22	0.61	1.24	0.95 (0.04)
Gov. urban	20	0.85	0.35	0.80	0.70	0.85	0.85	0.73 (0.06)
		0.80	0.15	0.75	0.55	0.70	0.80	0.63 (0.07)
		1.65	0.50	1.55	1.25	1.55	1.65	1.35 (0.12)
Total urban (46.6)	280	0.71	0.22	0.79	0.79	0.46	0.83	0.63 (0.02)
		0.42	0.02	0.53	0.44	0.22	0.45	0.34 (0.02)
		1.13	0.24	1.32	1.23	0.68	1.28	0.98 (0.03) ^{a,b}
Private rural town	40	0.85	0.50	0.88	0.93	0.73	0.90	0.80 (0.04)
		0.60	0.00	0.75	0.93	0.33	1.00	0.060 (0.05)
		1.45	0.50	1.63	1.86	1.06	1.90	1.39 (0.08)
Gov. rural town	80	0.89	0.40	0.90	1.01	0.64	0.99	0.80 (0.03)
		0.66	0.00	0.57	0.64	0.44	0.75	0.51 (0.05)
		1.55	0.40	1.47	1.65	1.08	1.74	1.31 (0.06)
Total rural town (20.0)	120	0.88	0.43	0.89	0.98	0.67	0.96	0.80 (0.02)
		0.64	0.00	0.63	0.73	0.40	0.83	0.54 (0.03)
		1.52	0.43	1.52	1.71	1.07	1.79	1.34 (0.05) ^a
Private rural village	0	0	0	0	0	0	0	0
Gov. rural village	200	0.90	0.66	0.91	0.93	0.75	0.96	0.84 (0.02)
		0.76	0.10	0.75	0.81	0.34	0.85	0.60 (0.03)
		1.66	0.76	1.66	1.74	1.09	1.81	1.44 (0.04)
Total rural village (33.3)	200	0.90	0.66	0.91	0.93	0.75	0.96	0.84 (0.02)
		0.76	0.10	0.75	0.81	0.34	0.85	0.60 (0.03)
		1.66	0.76	1.66	1.74	1.09	1.81	1.44 (0.04) ^b
Total (100)	600	0.81	0.41	0.85	0.87	0.60	0.90	0.74 (0.01)
		0.58	0.04	0.62	0.62	0.30	0.66	0.47 (0.02)
		1.39	0.45	1.47	1.49	0.90	1.56	1.21 (0.02)

^aDifference statically significant (P<0.005)

^bDifference statically significant (P<0.005)

Table 6. Mean debris, calculus and OHI-S score of index teeth of 15-year-old schoolchildren according to location and type of school.

Location & Type of School	n (%)	16 debris calculus Total	11 debris calculus Total	26 debris calculus Total	36 debris calculus Total	31 debris calculus Total	46 debris calculus Total	Mean Score (SE) debris calculus Total
Private urban	260	0.63 0.40 1.03	0.22 0.03 0.25	0.73 0.54 1.27	0.85 0.48 1.33	0.44 0.25 0.69	0.84 0.42 1.26	0.62 (0.02) 0.35 (0.02) 0.97 (0.03)
Gov. urban	20	0.65 0.75 1.40	0.55 0.15 0.70	0.75 0.70 1.45	0.85 0.55 1.40	0.60 0.60 1.20	0.90 0.95 1.85	0.72 (0.07) 0.62 (0.10) 1.33 (0.15)
Total urban	280 (46.7)	0.63 0.42 1.05	0.24 0.04 0.28	0.74 0.55 1.29	0.85 0.49 1.34	0.45 0.27 0.72	0.85 0.46 1.31	0.63 (0.02) 0.37 (0.02) 1.00 (0.03) ^{a,b}
Private rural town	40	0.88 0.90 1.78	0.60 0.08 0.68	0.90 0.90 1.80	0.78 0.80 1.58	0.93 0.60 1.53	0.84 0.83 1.67	0.84 (0.03) 0.68 (0.07) 1.52 (0.08)
Gov. rural town	60	0.75 0.68 1.43	0.35 0.02 0.37	0.78 0.68 1.46	0.83 0.80 1.63	0.55 0.38 0.93	0.83 0.88 1.74	0.68 (0.04) 0.58 (0.06) 1.26 (0.07)
Total rural town	100 (16.7)	0.80 0.77 1.57	0.45 0.04 0.49	0.86 0.77 1.63	0.86 0.80 1.66	0.64 0.47 1.11	0.87 0.86 1.73	0.75 (0.03) 0.62 (0.04) 1.37 (0.06) ^a
Private rural village	0	0	0	0	0	0	0	0
Gov. rural village	220	0.89 0.77 1.66	0.55 0.05 0.60	0.90 0.77 1.67	0.94 0.87 1.81	0.65 0.37 1.02	0.92 0.92 1.84	0.81 (0.02) 0.63 (0.03) 1.43 (0.03)
Total rural village	220 (36.3)	0.89 0.77 1.66	0.55 0.05 0.60	0.90 0.77 1.67	0.94 0.87 1.81	0.65 0.37 1.02	0.92 0.92 1.84	0.81 (0.02) 0.63 (0.03) 1.43 (0.03) ^b
Total	600 (100)	0.76 0.61 1.37	0.39 0.04 0.43	0.82 0.67 1.49	0.88 0.68 1.56	0.56 0.34 0.90	0.88 0.70 1.58	0.71 (0.01) 0.51 (0.02) 1.22 (0.02)

^aDifference statically significant (P<0.005)

^bDifference statically significant (P<0.005)

The proportion of the schoolchildren with good, fair and poor hygiene is presented for both age groups in Table 7. In both age groups a greater proportion of

females had good hygiene compared to males of the same age group.

Table 7. Proportion of schoolchildren with good, fair and poor oral hygiene scores.

Gender/Age	n	Good (%)	Fair (%)	Poor (%)	Total (%)
Male 12-13-years	324	51.2	48.8	0	100
Female 12-13-years	276	55.1	44.9	0	100
Total	600				
Male 15-years	362	45.3	56.7	0	100
Females 15 years	238	56.7	43.3	0	100
Total	600				

DISCUSSION OF THE RESULTS

The Simplified Oral Hygiene Index (OHI-S) has been widely used to evaluate the level of oral cleanliness in epidemiological studies. OHI-S is easy to use since the criteria are objective, the examinations can be carried out quickly and a high level of reproducibility is possible with minimum training. For these reasons OHI-S was chosen for this study. The disadvantage of OHI-S is that the index is not used internationally like the Community Periodontal Index (CPI) and opportunities for international comparison of results is limited. However, CPI is an index for assessment of periodontal status and does not provide information on the level of debris. CPI measures the outcomes of accumulated plaque: gingival inflammation and periodontal pockets.

Higher OHI-S scores were noted in the molar index teeth (46>36>26>16) followed by the incisor index teeth (31>11). This may be a reflection of the greater difficulty in cleaning the surfaces of posterior teeth relative to the anterior teeth. A toothbrush with a smaller head would aid in gaining access to the lingual surfaces of the lower molars and the buccal surfaces of the upper molars for the removal of plaque.

The overall OHI-S score for both 12-13-year-olds (1.21) and 15-year-olds (1.22) in the District of

Sunsari were almost identical and are indicative of good oral hygiene. However, a close examination of the OHI-S scores based on the type of school attended by the children shows statistically significant differences in mean OHI-S scores for both age groups ($P < 0.005$) (Table 1 and 2). For children of government schools the oral hygiene status can be rated as 'fair' compared to 'good' for children attending private schools. A better level of oral cleanliness amongst children enrolled in boarding (private) schools may be associated with a higher standard of education and higher standard of living since upper class and middle class families are more financially able to enroll their children in private schools. This finding is consistent with other countries such as the United States where a higher level of education and standard of living is associated with a better level of oral cleanliness⁸.

When the mean OHI-S scores are compared between males and females the scores were not statistically different in the 12-13-year-old age group. In the 15-year-old age group, females had better oral hygiene (OHI-S of 1.11) than males (OHI-S of 1.29) and this was statistically significant ($P < 0.005$). A greater proportion of females in the 12-13-year-old age group (55.1% scored 'good') and the 15-year-old age group (56.7% scored 'good') had good hygiene compared to 51.2% and 45.3% of the males respectively (Table 7). Proportion of schoolchildren

with poor hygiene was nil. Females have better oral hygiene and the variation between sexes may be attributed to behavioural differences⁸.

Schoolchildren in both age groups enrolled in urban schools had better oral cleanliness (good) than their counterparts in both rural towns (fair) and villages (fair) and the differences in OHI-S were statistically significant ($P < 0.005$) (Table 5 and 6). Although village schoolchildren had the highest OHI-S scores, the difference from the OHI-S score of rural town schoolchildren was not statistically significant. The variance noted between these groups based on location may be due to socio-economic factors and the availability and affordability of toothbrushes and fluoridated toothpaste.

Statements concerning any differences in oral cleanliness of schoolchildren of various ethnic groups are difficult to formulate since the data collected for some of the ethnic groups was small and not amenable to analysis.

Some dentists in Nepal have speculated that the major reason for the increase in dental caries in Nepal has been due to poor oral hygiene practices and that mere mechanical removal of plaque is sufficient to prevent dental caries. Oral cleanliness may not be as significant as the frequency of sugar consumption and use of fluoridated toothpaste in the development of dental caries in the schoolchildren of Sunsari District. The same schoolchildren surveyed for oral cleanliness were also examined for dental caries and the results were reported in a recent article⁴. When the mean 12-13-year-old DMFT and mean 15-year-old DMFT is compared with OHI-S, an inverse relationship is noted. Schoolchildren of these two age groups attending private schools had lower OHI-S scores than their counterparts attending government schools but they had a higher mean DMFT. In the case of 15-year-olds, the mean DMFT was significantly higher ($P < 0.001$) in boarding schools (mean DMFT = 0.80) than in government schools (mean DMFT = 0.54). Similarly, 15-year-old females (mean DMFT = 0.86) had a significantly

higher mean DMFT than males (mean DMFT = 0.55), but their oral hygiene was significantly better. This inverse relationship was also noted in schoolchildren attending urban schools, rural town schools and village schools. Urban schoolchildren had statistically significant lower OHI-S scores but recorded significantly higher mean 12-13-year-old and 15-year-old DMFTs.

The multifactorial relationship of plaque, sugar consumption, tooth susceptibility and time has been demonstrated in Tristan de Cunha^{9,10} and Hopewood House^{11,12}. The children and adults of these communities had poor oral hygiene and heavy plaque accumulation but remained relatively caries free as long as daily sugar consumption was low. Once the daily average consumption of sugar and refined carbohydrates increased, there was a corresponding increase in dental caries. Cross-sectional and prospective studies have also shown a weak positive association between plaque and dental caries¹³ and this has led some dentists to challenge the intrinsic value of oral hygiene practices in the prevention of dental caries^{14,15}. A Canadian Task Force¹⁵ reported on evidence-based treatment for dental caries in 1994 and concluded that brushing without fluoridated toothpaste to remove plaque was not cariostatic but brushing was essential for the application of fluoridated toothpaste and the prevention of gingivitis. In a systematic review, and up-date of the effectiveness of mechanic oral hygiene practices, Brothwell *et al*¹⁶ reported that there was good evidence to recommend tooth brushing twice daily with a fluoride toothpaste in the prevention and control of gingivitis and dental caries. The fluoride in toothpaste contributed largely to caries reduction. There is also good evidence to show that brushing with non-fluoridated toothpaste is ineffective in reducing dental caries^{13,17}. Controlling the frequency and amount of sugar consumed as well as fluoridation of the teeth are more important preventive measures than mere mechanical plaque control. Oral health education should emphasize brushing twice a day with fluoridated toothpaste and reducing the frequency of consumption of sugar between meals.

CONCLUSIONS

The following conclusions can be drawn from this evaluation of oral cleanliness in 12-13-year-old and 15-year-old schoolchildren in the District of Sunsari:

- Overall, the oral hygiene of these two age groups is good.
- 15-year-old females have significantly better OHI-S scores than their male counterparts ($P < 0.005$).
- Schoolchildren attending private schools have significantly better OHI-S scores than children attending government schools ($P < 0.005$).
- Urban schoolchildren have significantly better OHI-S scores than rural schoolchildren of the same age ($P < 0.005$).
- The differences in OHI-S of children attending private schools versus government schools may be due to socio-economic status.
- The variation in the OHI-S scores of urban and rural children may also be related to socio-economic status or the availability and affordability of toothbrushes.

When data from this study is analysed in light of the data concerning prevalence and experience of dental caries in the same subjects in the District of Sunsari⁴ the following conclusions and recommendations can be made:

- Urban schoolchildren, 12-13-years and 15-years, have better oral cleanliness but experience more dental caries than rural schoolchildren.
- 15-year-old female schoolchildren have significantly cleaner teeth than males of the same age, but they also experience more decay.
- Even though 12-13-year-old and 15-year-old

schoolchildren of private boarding schools have significantly better oral hygiene than their counterparts attending government schools, they experience relatively more decay.

- Better oral cleanliness is not associated with lower caries experience.
- Strategies for the prevention of dental caries should emphasize the use of fluoridated toothpaste twice a day and a reduction in the daily consumption of refined carbohydrates and sugar. Meticulous plaque removal is not essential and not as important in keeping dental caries low.

Correspondence: Dr. Robert Yee, United Mission to Nepal Oral Health Programme, P.O. Box 126, Kathmandu, Nepal.
Email: robeyee@wlink.com.np.

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