A Survey of Oral Health in Vientiane, Lao PDR

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INTRODUCTION

In the past few years several studies have reported that the burden of oral disease continues to spread in developing countries (Mosha *et al*., 1994, Ogawa *et al*., 2003, Uetani *et al*., 2006, Agbelusi *et al*., 2006, Chu *et al*., 2008). In the Lao People's Democratic Republic (PDR), living conditions have developed rapidly during the last decade (World Bank, 2009). According to the WHO World Oral Health Report 2003 (World Health Organization, 2003), the increasing incidences of oral diseases such as dental caries and periodontal disease are due to changing living conditions and the adoption of Western lifestyle habits. Therefore, it is likely that the prevalence rates of dental caries and periodontal disease have increased in the last few years.

The DMFT (Decayed, Missing, and Filled teeth) Index among 12-year-old school children in the Lao PDR increased from 2.0 in 1991 to 4.6 in 2001 (WHO Oral Health Country/Area Profile Programme, 2009). The periodontal country profiles

(2009) indicate that calculus is the most common (83%) condition. In 1991, half of the sextants in dentate individuals were scored as 2 (calculus). However, few oral health surveys using internationally recognized criteria have been undertaken in the Lao PDR. Therefore, there is a lack of information necessary for the planning and implementation of a public oral health programme. Effective public health measures are also limited, and improved oral health practices such as primary health care have not yet been implemented in the country. Consequently, useful oral health care programs based on the principle of primary health care, including improved oral hygiene and effective use of fluorides, are urgently needed. A National Oral Health Survey of oral health knowledge, attitudes, and behaviors using internationally recognized criteria is needed to correct deficiencies in the Laotian oral health care programme. Therefore, the purpose of this survey was to assess oral health status among an adult population in the Lao PDR and to investigate their knowledge of and attitudes toward oral health.

PARTICIPANTS & METHODS

Study subjects

Geographically, the Lao PDR is landlocked and is one of the least developed countries in the world. The population of the Lao PDR was estimated at 5.62 million in 2005. The majority of the population, 82.9%, lives in rural and remote areas that have no access to basic infrastructure and services (United Nations in Lao PDR, 2009).

Dongkhuwaai village was chosen as the location of the survey. It is located about 30 km from Vientiane, the capital of the Lao PDR. The daily activities of villagers consist mainly of a combination of subsistence agriculture, fishing, hunting and gathering. A total of 193 (79 men and 114 women) village inhabitants aged 20 to 44

years were selected as study subjects. Written informed consent for participation in this survey was obtained from all subjects.

Oral health examinations

To ensure the validity and reproducibility of assessments of oral status, dental examiners used the standard diagnostic criteria of the WHO Oral Health Survey: Basic Methods–Fourth edition (1997). Dental caries status was recorded using the DMFT Index, and periodontal health status was assessed by using the Community Periodontal Index (CPI). Calibration-training sessions were conducted for dental examiners before the survey. Experienced oral epidemiologists calibrated 8 dental surgeons before these surgeons assessed DMFT and CPI in volunteer patients from the Mahosot Hospital. By means of duplicate examination of 6 patients, interexaminer reliability was assessed among the 3 dental surgeons who had been judged to be the most qualified examiners. The proportions of observed agreement between all pairs of examiners were as follows: 0.97 to 1.00 in the DMFT of the crown, 0.84 to 0.88 in the DMFT of the root, and 0.50 to 0.83 in the CPI. The 3 trained examiners assessed the subjects' oral condition with mirrors and ball-point periodontal probes under daylight. No radiographs were taken. Local dentists conducted an in-person interview using a 22-item questionnaire designed to obtain information regarding smoking status and betel quid chewing, oral health behaviors, and oral health-related quality of life.

Statistical analysis

Of 193 individuals, 189 (75 men and 114 women; age range, 20 to 44 years) were included in the analysis: 4 persons older than 44 years were excluded. Subjects were then classified into 4 age groups (20 to 24 years, 25 to 29 years, 30 to 34 years, and 35

to 44 years).

The mean and standard deviation of the DMFT and CPI score in sextants were calculated for each age group and sex. Analysis of variance (ANOVA), and the Tukey multiple comparison test for subjects in the 35- to 44-yr-old group, were performed to evaluate differences in mean DMFT among age groups. Furthermore, the *t* test was used to examine sex differences in mean DMFT. The percentage of subjects for whom a particular CPI score was highest was calculated among each age group and sex.

In addition, for both sexes we calculated the percentages of responses to questionnaire items on oral health, including health of teeth and gums, toothache, gum bleeding on tooth brushing or eating during the last 12 months, frequency of tooth brushing, use of a fluoride containing toothpaste, and knowledge of oral health.

All calculations and statistical analyses were performed with SPSS software (Version 15.0 J, SPSS Inc., Chicago, USA). Statistical significance was defined as $p < 0.05$.

RESULTS

All 189 study subjects were dentate. The mean age of subjects was 30.7 ± 5.8 (men, 32.7 ± 5.2; women, 29.3 ± 5.9). The difference in age was statistically significant ($p<0.001$; *t* test). A total of 21.7% of subjects were current smokers, and 2.6% reported having a betel quid chewing habit.

Table 1 shows the mean DMFT scores of subjects. Subjects aged 35 to 44 years had significantly more missing teeth (MT) and DMFT, as compared to subjects in the other age groups ($p < 0.01$ for MT, $p < 0.01$ for DMFT). Mean number of MT in the 35- to 44-yr-old group was also significantly higher ($p < 0.01$) than that in the other age

groups, except for the 25- to 29-yr-old group. In the 35- to 44-yr-old group, women had significantly more DMFT than did men ($p < 0.01$). The mean DMFT among 25- to 29-yr-old women was also significantly higher ($p < 0.05$) than among men. In addition, women had significantly more decayed teeth (DT) than did men in the same 2 age groups ($p < 0.05$ for the 25- to 29-yr-old group, $p < 0.001$ for the 35- to 44-yr-old group). Among women, there was a steady increase in MT and mean DMFT with increasing age. There were no filled teeth (FT) in any study subject.

Table 2 shows the percentages of subjects for whom a particular CPI score was highest, by age and sex. The CPI mode was 2 (calculus) among all age groups.

The mean number of sextants with a particular CPI score per subject, by age and sex, is shown in Table 3. A score of 2 or higher was noted in 4 to 5 sextants among all age groups. Subjects in the 35- to 44-yr-old group had the lowest number of sextants with a score of 0 (no periodontal disease) among the 4 age groups. This indicates that subjects aged 35 to 44 years had the highest number of sextants with a 1+2+3+4 score (bleeding or worse) and with a 2+3+4 score (calculus or worse). There was a trend in which the number of sextants with a 1+2+3+4 and a 2+3+4 score increased with age.

The percentages of responses to questions regarding knowledge and attitude toward oral health by age and sex are shown in Table 4. Although no statistically significant differences by sex or age were noted, these findings show a large variation in oral health knowledge among the study subjects. A total of 48.9% of subjects were satisfied (very good or good) with the health condition of their teeth. Regarding the frequency of tooth brushing, the majority of subjects cleaned their teeth more than twice a day. A total of 65.9% subjects brushed their teeth with a fluoride-containing toothpaste, and 98.8% of subjects acknowledged the importance of tooth brushing in the prevention of dental caries and periodontal disease. However, 43.8% of men and 37.7% of women

believed that eating and drinking sugary foods and drinks did not affect the risk of dental caries (Table 5).

DISCUSSION

In the present study, the mean DMFs were 3.0, 3.5, 3.5, and 4.7 among subjects aged 20-24, 25-29, 30-34, and 35-44 years, respectively. These findings confirm those of previous reports (WHO Oral Health Country/Area Profile Programme, 2009), which observed a lower prevalence of dental caries in the Lao PDR. However, we observed a slight increase in mean DMFT, which was mostly due to the number of decayed teeth (DT): 2.9-3.6 among all age groups. Miyazaki *et al* (1996) suggested that the main reason for the increase in dental caries was the increase in per capita sugar consumption. Yabao *et al* (2005) reported that dental caries increased with higher sugar consumption among children aged 6-12 years in the Philippines; Uetani *et al* (2006) also reported a high number of dental caries among children who frequently consumed sweets in southern Vietnam. In the Lao PDR, sugar consumption has recently increased, as is the case in other developing countries (WHO Oral Health Country/Area Profile Programme, 2009). Although recent information is not available, a twofold increase was observed over the 10-year-period from 1991 to 2000 (International Sugar Organization 1997, 2002).

With respect to the CPI results, calculus deposits were very frequent among the subjects. This finding is in accordance with a previous report on Savannakhet Province, (Chuckpaiwong *et al*., 2000), which indicated that the most common periodontal problem was calculus deposits in 3-5 sextants. The CPI distribution has remained relatively unchanged since 2000. Several reports have noted that gingival condition was

affected by calculus deposits among individuals who did not practice proper, regular oral hygiene (Rustogi *et al*., 1991, Löe *et al*., 1992 and Joshipura *et al*., 1994). In addition, Gaare *et al* (1990) suggested that instruction in tooth brushing improved gingival health in a population with a high level of supragingival calculus. To improve oral health status by preventing periodontal disease at an early stage, proper oral hygiene practice, especially among children, should be emphasized. In addition, primary oral health staff, including dentists and other health workers, should be trained to promote oral health and self-care in the community.

The mean number of missing teeth (MT) was high among the 35- to 44-yr-old group, whereas the mean number of sextants with 3+4 (shallow pockets or worse) was low. However, no subjects had filled teeth (FT). This finding suggests that extraction of teeth is a routine treatment for pain relief, due to limited access to appropriate oral health care services (Petersen *et al*., 1998, Chu *et al*., 2008). Such basic treatment procedures were reported in other studies in developing countries where few dental personnel and resources were available (Ogawa *et al*., 2003, Varenne *et al*., 2006). In order to improve access to dental care for untreated teeth, which could be restored by means of appropriate treatment, it is necessary for the Lao PDR to develop a primary oral health care system that includes oral health education and promotion and use of atraumatic restorative treatment (ART).

The results of the oral health questionnaire showed that tooth brushing is common practice in the subjects. Brushing teeth twice a day or more in the Lao PDR is relatively similar to the frequency observed in Eastern Europe (Petersen *et al*., 1997, Petersen *et al*., 2000); however, oral health knowledge, practices, and attitudes were less related to the prevalence rates of dental caries and periodontal status in the present study group. We speculate that promoting oral health as part of a primary health care approach

could be useful for oral disease prevention in a country where lifestyles are rapidly changing. Zhu *et al* (2005) described a program of systematic community-based oral health promotion that stimulated the development of oral health awareness, dental attitudes, and personal skills—including promotion of additional self-care practices and the use of fluoridated toothpaste—among Chinese adults. Likewise, in the Lao PDR, effective community-based oral health promotion and the securing of primary oral health care resources should be implemented to address the discrepancy between oral health knowledge and practice.

In conclusion, we observed that the most common oral health problem was calculus deposits, which were found in 4-5 sextants among all age groups. In addition, oral health knowledge, practice, and attitudes were limited among all age groups. This discrepancy between oral health knowledge and practice is a potential problem for the maintenance of oral health in the Lao PDR.

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Table 1. Mean DMFT scores, by age and sex

			Mean±SD				
	Age (yrs)	Total n	DT	MT	FT	DMFT	
All		189	3.2±3.2	0.5±1.4	0	3.7±3.9	
Men	20-24	7	1.7±1.7	0.4±1.1	0	2.1±2.3	
	25-29	14	2.0±1.7	0.2±0.6	0	2.2±2.0	
	30-34	23	2.9±2.6	0.2±0.7	0	3.0±2.8	
	35-44	31	2.3±2.2	0.6±1.5	0	2.8±3.2	
			NS[a]	NS[a]		NS[a]	
Women	20-24	32	3.1±3.6	0.1±0.2	*[b]	0	3.2±3.8	**[b]
	25-29	25	3.8±3.6	0.4±1.0	**[b]	0	4.2±3.8	NS[b]
	30-34	33	3.5±3.7	0.4±0.9	*[b]	0	3.9±3.8	*[b]
	35-44	24	5.3±3.4	1.7±3.0		0	7.0±5.7	
			NS[a]	p=0.001[a]			p=0.009[a]	
Total	20-24	39	2.9±3.4	0.1±0.5	**[b]	0	3.0±3.6	
	25-29	39	3.2±3.2	0.3±0.8	NS[b]	0	3.5±3.4	
	30-34	56	3.2±3.3	0.3±0.9	*[b]	0	3.5±3.4	
	35-44	55	3.6±3.2	1.1±2.3		0	4.7±4.9	
			NS[a]	p=0.005[a]			NS[a]	

a p value by ANOVA

b Tukey multiple comparison test for subjects aged 35-44 years

* $p<0.05$

** $p<0.01$

NS: Not significant

Table 2. Highest CPI score of subjects (%), by age and sex

			Percentage of persons who have as highest score				
			0	1	2	3	4
	Age (yrs)	Total n	No periodontal disease	Bleeding on probing	Calculus	Shallow pockets (4 or 5 mm)	Deep pockets (6+ mm)
Men	20-24	7	0	0	100	0	0
	25-29	14	0	0	100	0	0
	30-34	23	0	0	87.0	13.0	0
	35-44	31	0	3.2	77.4	19.4	0
Women	20-24	32	3.1	0	96.9	0	0
	25-29	25	4.0	0	88.0	8.0	0
	30-34	33	0	0	81.8	18.2	0
	35-44	24	0	0	83.3	16.7	0
Total	20-24	39	2.6	0	97.4	0	0
	25-29	39	2.6	0	92.3	5.1	0
	30-34	56	0	0	83.9	16.1	0
	35-44	55	0	1.8	80.0	18.2	0

Table 3. Mean number of sextants with a particular CPI score per subject, by age and sex

			Mean number (Mean±SD) of sextants with					
	Age (yrs)	Total n	0 No periodontal disease	1+2+3+4 Bleeding or higher score	2+3+4 Calculus or higher score	3+4 Shallow pockets or higher score	4 Deep pockets	X Excluded fewer than 2 teeth
Men	20-24	7	0.29±0.48	5.71±0.49	5.43±0.79	0	0	0
	25-29	14	0.29±1.07	5.71±1.07	5.14±1.41	0	0	0
	30-34	23	0.30±0.56	5.70±0.56	5.35±0.71	0.26±0.75	0	0
	35-44	31	0.13±0.42	5.84±0.45	5.19±1.42	0.32±0.65	0	0.03±0.18
Women	20-24	32	1.13±1.50	4.88±1.50	4.28±1.65	0	0	0
	25-29	25	0.92±1.50	5.08±1.50	4.44±1.66	0.12±0.44	0	0
	30-34	33	0.58±0.79	5.42±0.79	4.88±0.96	0.27±0.67	0	0
	35-44	24	0.38±0.92	5.54±0.98	5.25±0.99	0.42±1.32	0	0.08±0.41
Total	20-24	39	0.97±1.41	5.03±1.40	4.49±1.59	0	0	0
	25-29	39	0.69±1.38	5.31±1.38	4.69±1.59	0.08±0.35	0	0
	30-34	56	0.46±0.71	5.54±0.71	5.07±0.89	0.27±0.70	0	0
	35-44	55	0.24±0.69	5.71±0.74	5.22±1.24	0.36±0.98	0	0.05±0.29

Table 4a. Responses to questions on oral health and oral health behavior (%), by age and sex

Question		Answer	Age (yrs) 20-24	25-29	30-34	35-44	*p* value
Health of your teeth	Men	Very good	0.0	23.1	5.0	20.0	NS
		Good	66.7	38.5	40.0	24.0	
		Fair	0.0	7.7	20.0	32.0	
		Poor	33.3	30.8	35.0	24.0	
		Very poor	0	0	0	0	
	Women	Very good	20.0	12.5	19.4	19.0	NS
		Good	26.7	41.7	35.5	14.3	
		Fair	26.7	12.5	194	42.9	
		Poor	26.7	33.3	25.8	23.8	
		Very poor	0	0	0	0	
Health of your gums	Men	Very good	0	15.4	5.0	8.0	NS
		Good	33.3	30.8	45.0	40.0	
		Fair	16.7	38.5	25.0	16.0	
		Poor	50.0	15.4	25.0	32.0	
		Very poor	0	0	0	4.0	
	Women	Very good	6.7	4.2	9.7	9.5	NS
		Good	46.7	37.5	51.6	47.6	
		Fair	13.3	25.0	16.1	19.0	
		Poor	33.3	29.2	22.6	23.8	
		Very poor	0	4.2	0	0	
Toothache during the last 12 months	Men	Often	0	15.4	10.0	16.0	NS
		Occasionally	16.7	15.4	45.0	20.0	
		Rarely	16.7	0	0	0	
		Never	66.7	69.2	45.0	64.0	
	Women	Often	20.0	16.7	16.1	23.8	NS
		Occasionally	23.3	33.3	25.8	38.1	
		Rarely	3.3	4.2	3.2	9.5	
		Never	53.3	45.8	54.8	28.6	

NS: Not significant

Table 4b. Responses to questions on oral health and oral health behavior (%), by age and sex

Question		Answer	Age (yrs) 20-24	25-29	30-34	35-44	*p* value
Experience gum bleeding during the last 12 months	Men	Often	0	0	5.3	8.0	NS
		Occasionally	66.7	46.2	47.4	20.0	
		Rarely	0	7.7	0	4.0	
		Never	33.3	46.2	47.4	68.0	
	Women	Often	0	4.2	6.7	9.5	NS
		Occasionally	34.5	50.0	36.7	28.6	
		Rarely	3.4	8.3	0	4.8	
		Never	62.1	37.5	56.7	57.1	
Frequency of tooth brushing	Men	Seldom	0	0	0	0	NS
		Once a day	33.3	38.5	20.0	20.0	
		Twice a day	66.7	53.8	75.0	80.0	
		Three times of a day	0	7.7	5.0	0	
	Women	Seldom	0	0	0	0	NS
		Once a day	13.3	12.5	6.9	4.8	
		Twice a day	73.3	70.8	89.7	90.5	
		Three times of a day	13.3	16.7	3.4	4.8	
Use of fluoride containing tooth paste	Men	Yes	66.7	46.2	65.0	68.0	NS
		No	0	0	0	4.0	
		Don't know	33.3	53.8	35.0	28.0	
	Women	Yes	72.4	56.5	70.0	71.4	NS
		No	0	0	0	0	
		Don't know	27.6	43.5	30.0	28.6	

NS: Not significant

Table 5. Responses to questions on oral health knowledge (%), by age and sex

Question		Answer	Age (yrs) 20-24	25-29	30-34	35-44	*p* value
Cleaning your teeth can prevent tooth decay	Men	Agree	100	100	100	96.0	NS
		Disagree	0	0	0	4.0	
		Don't know	0	0	0	0	
	Women	Agree	100	100	100	95.2	NS
		Disagree	0	0	0	4.8	
		Don't know	0	0	0	0	
Tooth cleaning will prevent gum disease	Men	Agree	100	100	100	100	NS
		Disagree	0	0	0	0	
		Don't know	0	0	0	0	
	Women	Agree	100	100	100	95.2	NS
		Disagree	0	0	0	4.8	
		Don't know	0	0	0	0	
Eating or drinking sweet things doesn't cause caries	Men	Agree	50.0	38.5	45.0	60.0	NS
		Disagree	50.0	53.8	50.0	32.0	
		Don't know	0	7.7	5.0	8.0	
	Women	Agree	66.7	45.8	64.5	57.1	NS
		Disagree	33.3	50.0	35.5	33.3	
		Don't know	0	4.2	0	9.5	

NS: Not significant