SPECIAL SECTION
Clinical

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Periodontal Conditions in Adult Southern Chinese

ABSTRACT

Periodontal diseases remain a concern in adult populations, but there have been no systematic descriptions of periodontal conditions, which have included periodontal attachment loss, among Southern Chinese. The main aim of this report is to describe the periodontal conditions in adult Chinese and to investigate factors that may have influenced periodontal attachment loss. Subjects were recruited from urban and rural survey sites throughout Guangdong. In total, 1572 35- to 44-year-old subjects and 1286 65- to 74-year-old subjects completed a structured interview and underwent a periodontal examination, which included the Community Periodontal Index (CPI) and periodontal Attachment Loss (ALoss) recordings. Calculus was found as the highest CPI score in 61-68% of the 35- to 44-year-old subjects and in 54-57% of the 65- to 74-year-olds. Shallow pockets were found as the highest CPI score in about one-third of both the urban and the rural subjects in both age groups, and deep pockets in 3-7% of the subjects. ALoss was more prevalent than pockets in both age groups. On the basis of the ALoss recordings, about one-third of the subjects in both age groups were categorized as exhibiting considerable ALoss for their age. In both age groups, logistic regression analysis indicated that being male, wearing partial dentures, and reporting less frequent toothbrushing were found to be associated with considerable ALoss.

KEY WORDS: periodontal disease, elderly, adults, oral health survey, Chinese.

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INTRODUCTION

The prevalence of periodontal conditions recorded by the Community Periodontal Index (of Treatment Needs) (CPI(TN)) in the People's Republic of China has been reported for a selected group of 35- to 44-year-old residents of Shandong Province (Powell *et al.*, 1986), for 35- to 44-year-old factory workers in Shanghai (Pilot *et al.*, 1989), for elderly residents of Shanghai (Hu *et al.*, 1990), and for 35- to 44-year-old and 65- to 74-year-old residents of Hubei Province (Petersen *et al.*, 1997). The CPI(TN) as used in these surveys (Ainamo *et al.*, 1982) did not include any recordings of attachment loss. CPI(TN) findings and attachment loss findings have been reported for Chinese residents of Hong Kong aged 35-44 and 65-74 years (Holmgren *et al.*, 1994). Periodontal attachment loss has been reported for 60- to 80-year-old Chinese in the Beijing area of Northern China (Baelum *et al.*, 1988). Apart from the Hong Kong survey (Holmgren *et al.*, 1994), there have been no systematic descriptions of periodontal conditions which have included periodontal attachment loss among Southern Chinese. Thus, as part of a socio-epidemiological survey on oral health conditions and factors which may influence oral health conditions among adults and elderly residents of Guangdong Province, periodontal conditions and periodontal attachment loss were recorded according to the current CPI guidelines of the World Health Organization (1997).

The objectives of the present analysis were to describe the periodontal conditions, including attachment loss, of 35- to 44-year-old and 65- to 74-year-old residents of urban and rural locations in Guangdong Province in Southern China, and to investigate factors that may have influenced periodontal attachment loss in the study subjects.

MATERIALS & METHODS

Altogether, 1572 35- to 44-year-old and 1286 65- to 74-year-old dentate Chinese living in both urban districts and rural areas of Guangdong Province, Southern China, were interviewed and examined clinically for periodontal conditions. Sampling methods and the means by which subjects were recruited have been described in detail in a preceding paper (Schwarz *et al.*, 2001). In brief, 16 sampling sites, 8 rural and 8 urban, were selected through the following method. First, 4 representative major administrative regions of the Province were chosen for the survey, mainly based on their geographic location. Then, by two-stage stratified random sampling, 2 urban sub-districts and 2 rural townships in each region were selected to be the survey sites. In each urban survey site, about 100 35- to 44-year-old subjects were recruited from factories and other work places, to include different occupation groups, and about 100 65- to 74-year-olds were recruited from their residences. In each rural survey site, about 100 subjects in each of the 2 age groups were recruited from their homes in the villages.

All subjects underwent a structured interview conducted by trained interviewers in an appropriate dialect using a structured questionnaire, which sought responses to questions on: demographic background; perceived oral health conditions; oral health knowledge, attitudes, and practices; and dental service utilization. After the interview, dentate subjects with no contra-indicating

medical history were examined by one of three trained and calibrated examiners. The examination procedures for the Community Periodontal Index (CPI) as recommended by the World Health Organization (1997) were followed, except that for the 65- to 74-year-old subjects, every remaining tooth, other than retained roots scheduled for extraction, was examined, and the findings for each remaining tooth were recorded. Overhead lights, plane mouth mirrors, and lightweight CPI probes were used in the examinations. The CPI probe was used in a "sensing" fashion around the tooth to determine the greatest probing pocket depth, to detect subgingival calculus, and to provoke inflammatory gingival bleeding. A light "sensing" force was used, and the total extent of the sulcus or pocket was explored. The highest score was recorded thus: 0 – Healthy, no pockets; 1 – Bleeding after probing, no pockets; 2 – Calculus, no pockets; 3 – Pocket 4-5 mm; 4 – Pocket 6 mm or more; X – Excluded sextant if less than 2 teeth in the sextant (for 35- to 44-year-old subjects); 9 – Not recorded (for teeth in 65- to 74-year-old subjects). The highest score *per* sextant was recorded for the 35- to 44-year-old subjects. For the 65- to 74-year-old subjects, the highest CPI score *per* tooth was recorded, and a computer program was specially written to generate the highest CPI score *per* sextant according to the rules of the CPI for index teeth, their substitution if missing, and for missing sextants, as given by the World Health Organization (1997).

Attachment loss (ALoss) was estimated according to the WHO (1997) recommended categories: code 0 = ALoss 0–3 mm (Cement Enamel Junction [CEJ] not visible and CPI score 0 – 3). However, if the CPI score was 4 and/or if the CEJ was visible, then:

code 1 = ALoss 4–5 mm (CEJ within black band on CPI probe);
code 2 = ALoss 6–8 mm (CEJ between black band and 8.5-mm ring);
code 3 = ALoss 9–11 mm (CEJ between 8.5-mm and 11.5-mm rings);
code 4 = ALoss 12 mm or more (CEJ beyond 11.5-mm ring);
code X = Excluded sextant, less than 2 teeth present, for 35- to 44-year-old subjects; and
code 9 = Not recorded (CEJ neither detectable nor estimatable due to calculus or restorations).

Examiner training and calibration were undertaken before the survey, and duplicate examinations were conducted for 10% of subjects after a recovery period was allowed for any gingival bleeding tendency to stabilize. Inter-examiner reliability was tested by means of the weighted Kappa statistic (Cohen, 1968). The weighted Kappa statistic for inter-examiner consistency among the three examiners for the CPI scores ranged from 0.60 to 0.70 for the 35- to 44-year-olds and from 0.88 to 0.91 for the 65- to 74-year-olds. For the ALoss scores for the 35- to 44-year-olds, the weighted Kappa statistic ranged from 0.67 to 0.75, and for the 65- to 74-year-olds, it ranged from 0.88 to 0.91.

The highest CPI score and ALoss score may not necessarily have been found on the same tooth in a sextant for 35- to 44-year-old subjects, nor on the same site of a tooth for the 65- to 74-year-old subjects. Subjects were classified as exhibiting considerable ALoss, or not, for their age on the basis of their ALoss recordings. Among the 35- to 44-year-olds, a subject was categorized as exhibiting considerable ALoss if 4 to 6 sextants had sufficient teeth and were scored, and if, of these, 2 or more were found to have an ALoss score of 1 or more (attachment loss of at least 4 mm), and if only 3 or fewer sextants were scored and of these 1 or more had an ALoss score of 1 or more. Among the 65- to 74-year-olds, a subject was categorized as exhibiting considerable ALoss if 4 to 6 sextants had sufficient teeth to register a CPI score and if, of these, 2 or more sextants had a tooth with an ALoss score of 2 or more (attachment loss of at least 6 mm) and if only 3 or fewer sextants were scored and of these 1 or more had a tooth with an ALoss score of 2 or more.

The association between considerable ALoss in a subject and selected categorical variables was investigated by the performance of independent Chi-square tests. The differences in mean scores of selected continuous variables between subjects categorized as exhibiting considerable ALoss and those categorized as not exhibiting considerable ALoss were investigated by independent sample *t* tests. The calculation of dental knowledge and attitude scores and the FMPI has been described in a previous paper (Lin *et al.*, 2001). Logistic regression analysis was used to investigate the association between considerable ALoss and a set of independent variables: location, gender, education level, reported toothbrushing frequency, dental anxiety, last dental visit, reported use of toothpick, rinsing habits, partial denture wearing, dental knowledge score, dental attitude score, Family Materials Possession Index (FMPI), and years of smoking. A backward stepwise selection method was used, and only the significant variables were retained in the final models. Statistical significance level was set at 0.05.

RESULTS

The percentage distribution of urban and rural subjects in both age groups by the highest CPI scores is shown in Table 1. In total, 1572 35- to 44-year-olds were examined and CPI and ALoss scores recorded. Of the 1515 65- to 74-year-olds recruited into the survey (85%), 1286 were found to have sufficient teeth not indicated for extraction and to have no contra-indicating medical history to qualify them for CPI and ALoss scoring. Among those subjects who underwent the periodontal examination, few had healthy periodontal conditions in the absence of calculus. Most subjects in both age groups scored either calculus or shallow pockets, and only a small proportion were recorded as having deep pockets. Forty-four percent of the urban and 39% of the rural 35- to 44-year-old subjects showed no attachment loss greater than 3 mm in any recorded sextant, whereas only 7% of the urban and 6% of the rural 65- to 74-year-olds were found to have no attachment loss greater than 3 mm in any of the remaining sextants. Fifty-six percent of the urban and 61% of the rural 35- to 44-year-olds displayed attachment loss of 4 mm or more on at least 1 of the teeth examined through the application of the sextant approach, whereas only 34% of the

Table 1. Percentage Distribution of Subjects by Highest CPI Score (by sextant)

Age (yrs)	Location	n	Percentage Subjects with Highest CPI Score				
			0	1	2	3	4
35-44							
	Urban	798	0	< 1	61	34	5
	Rural	774	0	< 1	68	29	3
65-74	Urban	683	< 1	2	54	37	7
	Rural	603	0	1	57	37	6

Table 2. Mean Numbers of Sextants with Different Levels of CPI Scores and Mean Numbers of Sextants with Attachment Loss (ALoss) Scores

Age (yrs)	Location	n	Mean Number of Sextants with CPI Score					
			0	1+2+3+4	2+3+4	3+4	4	X
35-44	Urban	798	0.2	5.7	5.3	0.8	0.1	0.1
	Rural	774	0.2	5.7	5.4	0.6	0.1	0.2
65-74	Urban	683	0.1	4.4	4.1	0.9	0.1	1.6
	Rural	603	<0.1	4.0	3.8	0.7	0.1	2.0

Age (yrs)	Location	n	Mean Number of Sextants with ALoss Score					
			0	1	2	3	4	9/X
35-44	Urban	798	4.6	1.2	0.1	<0.1	<0.1	0.1
	Rural	774	4.3	1.3	0.2	<0.1	<0.1	0.2
65-74	Urban	683	1.6	2.0	0.6	0.1	0.1	1.6
	Rural	603	1.3	1.7	0.7	0.1	<0.1	2.0

urban and 29% of the rural 35- to 44-year-olds were found to have a pocket of 4 mm or more. Forty-eight percent of the urban and 55% of the rural elderly were found to have at least 1 remaining tooth with attachment loss of 6 mm or more, whereas only 7% and 6%, respectively, were found to have a deep pocket. Table 2 gives the mean numbers of sextants according to various CPI scores and of sextants excluded as well as the mean numbers of sextants with the various ALoss scores and of sextants for which ALoss scores were not given. It is obvious that calculus was widely prevalent in the subjects in both age groups. Excluded sextants, due to there remaining less than 2 teeth after indications for extraction were accounted for, were more prevalent in the 65- to 74-year-old subjects. For the 65- to 74-year-old subjects, the ALoss scores *per* sextant were calculated in the same fashion as the CPI sextant scores for this age group, and the mean number of sextants was derived from this calculation. A greater prevalence of ALoss in the 65- to 74-year-old subjects was apparent, as was the greater mean number of sextants in which ALoss scores were not or could not be recorded.

According to the criteria used in this study, 38% of the urban and 42% of the rural 35- to 44-year-old subjects were categorized as exhibiting considerable ALoss for subjects their age. Thirty-one percent of urban and 38% of rural 65- to 74-year-old subjects were categorized as exhibiting considerable ALoss for subjects their age (in electronic appendix).

Results of independent Chi-square tests on the association between selected categorical variables and the distribution of subjects with considerable ALoss are shown in Table A1 (in electronic appendix) for the 35- to 44-year-old subjects and in Table A2 for the 65- to 74-year-old subjects (in electronic appendix). Independent sample *t* tests on the mean differences between subjects categorized as exhibiting considerable ALoss and those not so categorized are shown in Table A3 for both age groups (in electronic appendix). Results of logistic regression analysis between significant independent variables and considerable ALoss are shown in Table 3 for the 35- to 44-year-old subjects and in Table 4 for the 65- to 74-year-old subjects. For the 35- to 44-year-olds, being male, having less education, reporting less frequent toothbrushing, reporting a shorter time since the last dental visit, being a partial denture wearer, and having an increased number of years as a tobacco-smoker were all associated with an increased likelihood of being categorized as exhibiting considerable ALoss (Table 3). For the 65- to 74-year-olds, being a rural dweller, being male, reporting less frequent toothbrushing, not using toothpicks, and being a partial denture wearer were all associated with a greater likelihood of being categorized as exhibiting considerable ALoss (Table 4).

DISCUSSION

Chinese residents of various parts of the People's Republic of China and in Hong Kong demonstrate a variation in periodontal conditions, particularly shallow and deep pockets recorded, across a range of CPI(TN) surveys (summary table is provided as Table 5.) The prevalence of those urban 35- to 44-year-old subjects with pockets in the present survey in Guangdong is less than that in neighboring Hong Kong but greater than that reported among residents of Hubei (Petersen *et al.*, 1997). The reasons which might underlie such a variation in periodontal conditions as recorded by the CPI(TN) throughout China are unclear. That such differences in prevalence of various periodontal conditions are reported for one, albeit the world's largest, country highlights the difficulties in interpreting the periodontal profiles portrayed by CPI(TN) data in the WHO Global Oral Data Bank (WHO, 1995). Comparative data on 65- to 74-year-old Chinese subjects in different regions of the People's Republic of China and Hong Kong are shown in Table 6. The prevalence of pockets in the elderly residents of Guangdong is between that recorded for elderly residents of Hubei (Petersen *et al.*, 1997) and those of Shanghai (Hu *et al.*, 1990). If periodontal pocket depths, as recorded by CPI(TN), are to be considered an appropriate measure of periodontal disease severity, the results of the present study might suggest that the periodontal conditions of the elderly residents of Guangdong are not too serious and not as serious as those among Hong Kong's elderly residents (Holmgren *et al.*, 1994).

The use of attachment loss rather than pocket depth as the indicator of periodontal disease has been proposed (Carlos *et al.*, 1989). The relationship between attachment loss and CPI(TN) findings in adult rural Kenyans has been studied, and it was demonstrated that CPI(TN) scores do not consistently correlate with attachment loss findings (Baelum *et al.*, 1995). Attachment loss was measured in Hong Kong adults and elderly (Holmgren *et al.*, 1994) in the same manner as in residents of Guangdong. Indeed, although the CPI(TN) has been evaluated in many studies (Grytten *et al.*, 1989; Holmgren and Corbet, 1990; Schürch *et al.*, 1990; Almas *et al.*, 1991; Butterworth and Sheiham, 1991; Baelum *et al.*, 1993a,b) and reviewed (Holmgren, 1994), and its limitations made known, it was used in this survey to allow for comparison between the data of urban residents in Guangdong and the data from residents of highly urbanized Hong Kong. For the same reason, among the 65- to 74-year-old subjects in this as in the Hong Kong survey, all teeth were examined, so that similar data sets would be available. Despite the differences in CPI pocket scores among the elderly of Hong Kong and urban Guangdong, 96% of the 65- to 74-year-old Hong Kong residents had attachment loss of 4 mm or more on at least 1 tooth, and 94%

of urban Guangdong elderly were found to have the same. Sixty-two percent of the Hong Kong elderly exhibited attachment loss of 6 mm or more, and 55% of urban Guangdong elderly exhibited the same severity of attachment loss. The proportion of surveyed 65- to 74-year-old subjects who were edentulous or were indicated for dental clearance in Hong Kong was 14%, while in urban Guangdong it was 5%, and the mean numbers of sextants excluded from the CPI recording were 1.8 in Hong Kong and 1.6 in urban Guangdong. Thus, while the CPI pocket scores for the 2 urban populations of 65- to 74-year-old Chinese resident in adjacent areas of Southern China suggested worse periodontal conditions in Hong Kong elderly, the attachment loss measurements showed very similar prevalence of attachment loss, and tooth loss was also similar in those scored for the CPI. Allowing for slight variations in the age groups, the ranges of attachment loss reported, and the presentation of the data, the attachment loss situation of Hong Kong and Guangdong 65- to 74-year-olds is in line with that reported for Beijing 60- to 80-year-old residents (Baelum *et al.*, 1988). For the 35- to 45-year-old subjects, not only was the prevalence of pockets greater among Hong Kong residents, but also attachment loss was more prevalent in Hong Kong adults, in that 74% displayed attachment loss of 4 mm or more on at least 1 tooth, whereas only 56% of urban Guangdong 35- to 44-year-olds displayed the same.

To facilitate the comparison of the urban Guangdong and Hong Kong data for the CPI and ALoss recordings, the three examiners were trained by, calibrated against, and intermittently supervised by one of the examiners (EFC) from the Hong Kong survey. For the duplicate examinations, a recovery period of at least 10 min was allowed between examinations to allow for the gingival bleeding tendency to stabilize; however, as can be seen from Table 2, bleeding sextants accounted for only a small proportion of sextants scored. Thus, the inter-examiner consistencies for CPI recordings were calculated largely on the basis of scores for calculus and pockets. The inter-examiner consistencies for CPI and ALoss recordings determined by the weighted kappa statistics were "substantial" or "good" (WHO, 1997). It may therefore be assumed that true differences may exist between the prevalence of periodontal pockets and attachment loss in Southern Chinese adults and in periodontal pockets, but not attachment loss, in the urban-dwelling elderly in Guangdong and the elderly in Hong Kong. The reasons which may underlie any differences in periodontal disease experience in these two racially and culturally similar populations are unclear at present and are worthy of further investigation.

Table 3. Final Model of the Logistic Regression Analysis for 35- to 44-year-olds Exhibiting Considerable Attachment Loss

Independent Variables	Beta	Odds Ratios (OR)	95% CI for OR	p-value
Gender				
Male	0.31	1.36	(1.00-1.83)	0.04
Female[a]				
Education				
Post-secondary	-0.79	0.46	(0.29-0.72)	< 0.01
Secondary	-0.19	0.83	(0.64-1.07)	
No school/primary[a]				
Toothbrushing				
Once or less a day	0.28	1.32	(1.05-1.67)	0.02
Twice or more a day[a]				
Last dental visit				
< 2 yrs	0.31	1.37	(1.08-1.74)	0.01
2-5 yrs	0.33	1.39	(1.04-1.86)	
> 5 yrs[a]				
Partial denture wearing				
Yes	1.05	2.85	(1.37-5.96)	0.01
No[a]				
Years of smoking	0.03	1.03	(1.01-1.05)	< 0.01
(Intercept)	-0.91			< 0.01

[a] Reference category.

Table 4. Final Model of the Logistic Regression Analysis for 65- to 74-year-olds Exhibiting Considerable Attachment Loss

Independent Variables	Beta	Odds Ratios (OR)	95% CI for OR	p-value
Location				
Urban	-0.25	0.78	(0.60-1.00)	0.05
Rural[a]				
Gender				
Male	0.40	1.49	(1.17-1.89)	< 0.01
Female[a]				
Toothbrushing				
Less than once a day	0.84	2.31	(1.49-3.57)	< 0.01
Once or more a day[a]				
Use of toothpick				
Yes	-0.45	0.64	(0.49-0.84)	< 0.01
No[a]				
Partial denture wearing				
Yes	0.49	1.63	(1.10-2.41)	0.02
No[a]				
(Intercept)	-0.98			< 0.01

[a] Reference category.

Table 5. Percentage Distribution by Highest CPI(TN) Score of Chinese Subjects Aged 35-44 Years Resident in the People's Republic of China and in Hong Kong

			CPI(TN) Scores				
Authors/Year	Place	n	0	1	2	3	4
Powell *et al.*, 1986	Shangdong	154	0	2	51	36	9
Pilot *et al.*, 1989	Shanghai	497	1	1	43	44	11
Holmgren *et al.*, 1994	Hong Kong	372	0	0	26	57	17
Petersen *et al.*, 1997	Hubei	417	1	2	90	7	1
Present Study	Guangdong urban	798	0	0.4	61	34	5
	Guangdong rural	774	0	0.4	68	29	3

Table 6. Percentage Distribution by Highest CPI(TN) Score of Chinese Subjects Aged 65-74 Years Resident in the People's Republic of China and in Hong Kong

			CPI(TN) Scores				
Authors/Year	Place	n	0	1	2	3	4
Hu *et al.*, 1990	Shanghai	600	0	2	56	17	25
Holmgren *et al.*, 1994	Hong Kong	453	0	0	34	51	15
Petersen *et al.*, 1997	Hubei	234	2	0.4	77	16	4
Present Study	Guangdong urban	683	0.4	1.8	54	37	7
	Guangdong rural	603	0	0.8	57	37	6

Periodontal attachment loss can be considered as an appropriate measure of periodontal disease experience. The World Health Organization recognized that fact by including recordings of attachment loss in its current CPI guidelines (1997). In the present study, when the CEJ was completely obscured by calculus or restorations, an estimate of the attachment loss was made when the alignment of adjacent teeth allowed, always underscoring if the examiner was in doubt. Thus, in the 35- to 44-year-old subjects, for most sextants with at least 2 teeth remaining, a recording of the highest range of attachment loss was available, and in the 65- to 74-year-olds, the same applied for most teeth not indicated for extraction. The WHO (1997) recommends recording periodontal attachment loss in ranges and reporting the prevalence of persons examined by the highest range of periodontal attachment loss encountered on examination conducted according to the guidelines given for examination. This approach does not allow for the determination of a mean attachment loss score for each survey subject, since each score represents, in fact, a range of possible attachment loss. The greatest attachment loss recorded for an individual could in fact be a reflection of a very localized lesion of periodontal attachment loss. Results of this survey showed that attachment loss is more extensive in the 65- to 74-year-olds than in the 35- to 44-year-olds, and that tooth loss and thus excluded sextants are more common in the elderly. Following a review of the data, it was decided to categorize all subjects according to whether each met an agreed definition of what could reasonably be regarded as considerable periodontal attachment loss for that age group in this population. Thus, all survey subjects were dichotomized in terms of their periodontal attachment loss experience, and this allowed for logistic regression analysis of independent variables generated from the questionnaire and the clinical examination, which in theory might influence periodontal attachment loss. The definitions generated on the basis of this study population's attachment loss experience, captured by the ALoss measure of the new CPI (WHO, 1997) and used in the subsequent analysis in this study, may not be applicable to other populations. If such an analytical approach is to be used in other study populations, the ALoss recordings of those studies should be reviewed first, so that reasonable definitions of a case of considerable ALoss in those populations can be established.

That rural elderly residents in Southern China were found to be more likely to exhibit considerable attachment loss is in line with the findings in Northern China (Baelum *et al.*, 1988). Gender has been shown to influence periodontal pockets in Chinese adults in Hong Kong (Corbet *et al.*, 1989), with males exhibiting worse conditions. This investigation confirmed that males aged 35 to 44 and 65 to 74 years in Guangdong were more likely to exhibit considerable attachment loss than females. Higher educational attainment in the 35- to 44-year-olds, but not in the 65- to 74-year-olds, was associated with less likelihood of exhibiting considerable attachment loss. Lower education levels have been associated with worse periodontal conditions in American adults (Oliver *et al.*, 1991). Lower educational attachment is a risk indicator but it is not a factor, which could be modified to affect the periodontal condition of subjects. Plaque control habits, however, can be altered. For both age groups, reported less-frequent toothbrushing was associated with higher likelihood of exhibiting considerable ALoss. Similarly, the use of toothpicks in the elderly was associated with a lesser likelihood of exhibiting considerable attachment loss. Removable partial dentures have been associated with increased periodontal breakdown (Derry and Bertram, 1970; Chandler and Brudvik, 1984; Isidor and Budtz-Jørgensen, 1987; Lappalainen *et al.*, 1987). Removable partial denture wearing was confirmed to be associated with a greater likelihood of considerable ALoss being exhibited in both 35- to 44- and 65- to 74-year-old subjects. The association between dental visits and the likelihood of exhibiting considerable ALoss perhaps is just a reflection that those with a worse periodontal status are more likely to have made a recent symptom-related dental visit. Poorer socio-economic status has been shown to be associated with worse attachment levels in older Americans (Beck *et al.*, 1995), but fewer family material possessions, as indicated by lower FMPI scores, were not shown in the logistic regression to be positively associated with considerable attachment loss, after other factors were controlled for, in Guangdong Province.

Tobacco smoking has been shown, in a variety of epidemiological studies, to be associated with greater attachment loss (Beck *et al.*, 1990; Horning *et al.*, 1992; Jette *et al.*, 1993; Locker and Leake, 1993; Grossi *et al.*, 1994, 1995). Jette and co-workers (1993) have demonstrated that the years of exposure to tobacco through individual consumption are associated with periodontal disease experience. The present study confirmed the significant correlation between years of smoking and increased likelihood of exhibiting considerable ALoss for the 35- to 45-year-old Guangdong residents.

The results of this large-scale socio-epidemiological study on periodontal conditions highlight the need for health promotion activities in Guangdong with respect to improved atraumatic oral hygiene practices, including denture hygiene for removable partial dentures, and tobacco smoking cessation for the control of the majority of periodontal conditions encountered. Current severe periodontal disease, as indicated by deep pockets, fortunately appears to be limited to a small proportion of Guangdong's adults and elderly.

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