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Areca chewing in Xiangtan, Hunan province, China: interviews with chewers

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BACKGROUND: To report on Areca chewing (AC) in Xiangtan, Hunan province, China, and to test the knowledge of chewers related to side effects of the habit.
METHODS: Interviews with 276 individuals were performed. A questionnaire including general data, chewing habits, educational level and knowledge about side effects were used. Data were analysed using SPSS. Chi-square test was used at a significance level of $P < 0.05$.
RESULTS: Around 257 individuals were chewers (male: 54.1%; female: 45.9%) and 19 were former chewers (male: 31.6%; female: 68.4%). Mean age of chewers was 36.1 years. Around 42.4% of chewers smoked; 58.0% had a drinking habit. Average period of chewing was 11.2 years. Around 88.3% of chewers did not include the nut (seed). Around 79.0% considered AC habits negative for general health and 85.2% for oral health.
CONCLUSIONS: Most respondents did not know that AC may induce oral submucous fibrosis and oral cancer. The 'betel quid' chewed in Xiangtan usually does not contain Areca 'nut' (seed, endosperm), but consists of the husk. As no studies on the chemical composition of the Areca husk have been published such investigations are urgently needed.
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Keywords: *Areca catechu*; betel quid, chewing habit; oral mucosa; PR China

Introduction

Areca chewing (AC) or betel quid chewing (BQC) are common habits in South- and Southeast Asia. Both habits are strongly associated with oral pre-cancer and oral cancer (OC), and Areca is a strong carcinogen as has recently been confirmed by the International Agency for Research on Cancer (1). AC and BQC habits vary as to composition and ingredients over the area where these habits are prevalent. Main components are parts of the Areca fruit (*Areca catechu* L., 'nut', seed, endosperm) (Figs 1 and 2), the betel leaf (*Piper betle* L.) and slaked lime. In contrast to probably all other geographical areas where the AC and/or BQC habits are prevalent, in Hunan province the main constituent is the husk of the Areca fruit. Erroneously, the husk has been referred to as 'nut' in some publications from China (2, 3). Reichart and Zhang (4) have addressed this misconception in an editorial. With this difference of the main ingredient in mind it is of interest that data of studies on AC in Hunan province showed that the carcinogenic risk seemed to be low (3). In a recent review, it was revealed that the prevalence of oral leucoplakia in AC chewers was 0.1–0.5%, of oral submucous fibrosis (OSF) 0.9–4.7% and of OC 0.05–0.02%. The prevalence of OC in OSF cases was also low (1.2–2.2%) (3). If these data on prevalence of OC from Hunan are compared with those of other geographical areas, where the BQC habit is prevalent considerable differences in prevalence of OC between Hunan province and other areas are obvious. It was suggested that this difference might be because of the fact that in Hunan province the dried husk of the betel fruit is chewed but rarely only with the 'nut' (seed). Another fact may be that AC chewers of Hunan Province never chew tobacco and betel leaf (*Piper betle* L.). The purpose of this study was to ask chewers and ex-chewers by interview about their habits including smoking and alcohol drinking as well as their knowledge on effects and particularly side effects of the AC-chewing habit.

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Materials and methods

Study area and population

This study was approved by the Ethic Committee of Charité, Virchow Klinikum, Berlin, Germany. The province of Hunan is one of the few provinces of China where the AC habit is prevalent. Hunan province lies in the central southern part of China between 24°38′ and

Figure 1 Different brands of Areca 'quid' as sold in markets of Hunan province.

30°08′ of northern latitude. Previous studies (5–7) have been conducted in Xiangtan because the prevalence of AC chewers is high and most factories and workshops of Areca production are found here. A team of three interviewers (XLZ, CJL and QZL) randomly addressed residents on the streets of Xiangtan who were willing to accept an interview about their AC-chewing habits during February–March 2007.

Questionnaire

A questionnaire was designed to include gender, age, ethnicity, educational level, smoking, alcohol drinking and detailed AC-chewing habits. Also included were questions related to knowledge on the relation between AC-chewing habit and oral disease, in particular OC and OSF. In addition, the questionnaire included questions related to prevalence of AC chewing among members of the 'larger' family. Individual data of 276 questionnaires were analysed by using SPSS Statistical Software Package 10.0 for windows. Statistic analysis was performed using the chi-square test. A P-value of <0.05 was considered statistically significant.

Results

Randomly addressed people from Xiangtan completed a total of 276 questionnaires. Table 1 shows general data and the AC habits. Around 257 individuals were

Figure 2 Areca 'quids' consisting of halved Areca fruits. In the lower row Areca husks are seen without 'nut' (seed). A brownish substance for flavouring has been painted on to the inner surface of the husk.

Table 1 General data and chewing habits of 257 chewers in Xiangtan

	Chewers (n = 257) n (%)				*Former chewers (n = 19) n (%)*		
	Males 139 (54.1)	*Females 118 (45.9)*	*Total N (%)*[a]	*P-value*	*Males 139 (54.1)*	*Females 118 (45.9)*	*Total N (%)*[a]
Age (years old)							
≤18	17 (12.2)	29 (24.6)	46 (17.9)	0.005	0 (0.0)	1 (7.7)	1 (5.3)
19–39	67 (48.2)	61 (51.7)	128 (49.8)		3 (50.0)	9 (69.2)	12 (63.1)
≥40	55 (39.6)	28 (23.7)	83 (32.3)		3 (50.0)	3 (23.1)	6 (31.6)
Smoking							
No	50 (36.0)	98 (83.1)	148 (57.6)	< 0.001	1 (16.7)	11 (84.6)	12 (63.2)
≤19 cig./day	25 (18.0)	9 (7.6)	34 (13.2)		3 (50.0)	0 (0.0)	3 (15.8)
≥20 cig./day	64 (46.0)	11 (9.3)	75 (29.2)		2 (33.3)	2 (15.4)	4 (21.0)
Drinking[b]							
No	37 (26.6)	71 (60.2)	108 (42.0)	< 0.001	2 (33.3)	8 (61.5)	10 (52.6)
≤199 ml spirit/day	85 (61.2)	46 (39.0)	131 (51.0)		3 (50.0)	5 (38.5)	8 (42.1)
≥200 ml spirit/day	17 (12.2)	1 (0.8)	18 (7.0)		1 (16.7)	0 (0.0)	1 (5.3)
Chewing period (years)							
≤5	37 (26.6)	42 (35.6)	79 (30.7)		2 (33.3)	5 (38.5)	7 (36.8)
6–10	39 (28.1)	29 (24.6)	68 (26.5)		1 (16.7)	4 (30.8)	5 (26.3)
11–19	35 (25.2)	25 (21.2)	60 (23.3)		3 (50.0)	4 (30.8)	7 (36.8)
20-	15 (10.8)	14 (11.9)	29 (11.3)		0 (0.0)	0 ()	0 (0.0)
unclear[c]	13 (9.4)	8 (6.8)	21 (8.2)		0 (0.0)	0 ()	0 (0.0)
Chewing every day							
No	32 (23.0)	37 (31.4)	69 (26.8)		2 (33.3)	4 (30.8)	6 (31.6)
Yes	107 (77.0)	81 (68.6)	188 (73.2)		4 (66.7)	9 (69.2)	13 (68.4)
Chewing quantity (Pcs)							
1–2	18 (12.9)	31 (26.3)	49 (19.1)	< 0.001	2 (33.3)	3 (23.1)	5 (26.3)
3–10	82 (59.0)	76 (64.4)	158 (61.5)		2 (33.3)	6 (43.2)	8 (42.1)
11–19	28 (20.1)	9 (7.6)	37 (14.4)		1 (16.7)	4 (30.8)	5 (26.3)
≥20	11 (7.9)	2 (1.7)	13 (5.0)		1 (16.7)	0 (0.0)	1 (5.3)
Chewing seed (nut)							
No	125 (89.9)	102 (86.4)	227 (88.3)		5 (83.1)	9 (69.2)	14 (73.7)
Yes	14 (10.1)	16 (13.6)	30 (11.7)		1 (16.7)	4 (30.8)	5 (26.3)
Feeling of stiffness							
No	102 (73.4)	103 (87.3)	205 (79.8)	0.006	4 (66.7)	11 (84.6)	15 (78.9)
Yes	37 (26.6)	15 (12.7)	52 (20.2)		2 (33.3)	2 (15.4)	4 (21.0)
Consultation of dentist							
No	124 (89.2)	109 (92.4)	233 (90.6)		4 (66.7)	9 (69.2)	13 (68.4)
Yes	15 (10.8)	9 (7.6)	24 (9.4)		2 (33.3)	4 (30.8)	6 (31.5)

[a]Total percentage may not add up to 100%.
[b]The alcohol content is usually between 52% and 60%. Wine and beer is already consumed in Xiangtan.
[c]Respondents were unable to give adequate answers.

chewers (male: $n = 139$, 54.1%; female: $n = 118$, 45.9%) and 19 were former chewers (male: $n = 6$, 31.6%; female: $n = 13$, 68.4%). Around 50.7% ($n = 140$) were in the age group 19–39 years. The mean age of chewers was 36.1 years. The mean age of former chewers was 37.1 years. The habit of smoking and drinking was correlated to gender with males being significantly ($P < 0.001$) different from females. The period of AC chewing was from several months to 44 years (average: 11.2 years). Around 188 (73.2%) chewers and 13 (68.4%) former chewers chewed every day. The respondents were divided into four groups according to the number of pieces chewed. The chewing quantity was correlated to gender with males significantly chewing more than females ($P < 0.001$). There was no significant correlation between men and women when gender was correlated with AC-chewing every day. Around 227 (88.3%) of AC-chewers reported that when chewing they excluded the seed ('nut'). There was no significant difference between men and women. Chewers with feeling of stiffness were correlated to gender and there was a significant difference between men and women ($P < 0.05$).

Table 2 shows data related to educational level with knowledge about effects of AC. Chewers were divided into four groups: low-educational level ($n = 71$, 27.6%), medium educational level ($n = 75$, 29.2%), high-educational level ($n = 94$, 36.6%) and medical staff ($n = 17$, 6.6%). Around 79.0% ($n = 203$) thought that AC habits were bad for general health and bad for health of teeth and gums ($n = 219$, 85.2%). These data were not significant when correlated to educational level.

Table 3 shows data related to educational level with reasons for chewing and relevant positive effects. The most common reason for chewing was 'good feeling' ($n = 101$, 39.3%). Around 24.1% thought that AC is good for fighting nervousness, clearing up halitosis (23.0%) and making communication easy (15.2%). The most common desired effect was relaxation ($n = 121$, 47.1%), followed by excitement (29.6%), comfortable feeling (23.3%) and happiness (15.6%). The intention of chewers to quit the AC habit before the interview was

Table 2 Educational level of 276 chewers and knowledge about side-effects of BQ-chewing

	Chewers (n = 257) n (%)						
	Low[a] *education 71 (27.6)*	*Medium*[b] *education 75 (29.2)*	*High*[c] *education 94 (36.6)*	*Medical*[d] *staff 17 (6.6)*	*Total (N = 257)*[e]	*P-value*	*Former chewers (N = 19) N (%)*[e]
For health							
Bad	52 (73.2)	57 (76.0)	80 (85.1)	14 (82.3)	203 (79.0)		17 (89.5)
Good	8 (11.3)	10 (13.3)	6 (6.4)	1 (5.9)	25 (9.7)		1 (5.3)
No opinion	11 (15.5)	8 (10.7)	8 (8.5)	2 (11.8)	29 (11.3)		1 (5.3)
For teeth and gum							
Bad	56 (78.9)	62 (82.7)	85 (90.4)	16 (94.1)	219 (85.2)		17 (89.5)
Good	8 (11.3)	11 (14.7)	4 (4.3)	0 (0.0)	23 (8.9)		0 (0.0)
No opinion	7 (9.9)	2 (2.7)	5 (5.3)	1 (5.9)	15 (5.8)		2 (10.5)
Know stiffness							
Yes	21 (29.6)	27 (36.0)	45 (47.9)	15 (88.2)	108 (42.0)	< 0.001	13 (68.4)
No	50 (70.4)	48 (64.0)	49 (52.1)	2 (11.8)	149 (58.0)		6 (31.6)
Know cancer							
Yes	28 (39.4)	30 (40.0)	55 (58.5)	15 (88.2)	128 (49.8)	< 0.001	16 (84.2)
No	43 (60.6)	45 (60.0)	39 (41.5)	2 (11.8)	129 (50.2)		3 (15.8)
Know OSF							
Yes	3 (4.2)	9 (12.0)	16 (17.0)	11 (64.7)	39 (15.2)	< 0.001	5 (26.3)
No	68 (95.8)	66 (88.0)	78 (83.0)	6 (35.3)	218 (84.8)		14 (73.7)
Know OSF-Ca							
Yes	3 (4.2)	9 (12.0)	16 (17.0)	11 (64.7)	39 (15.2)	< 0.001	5 (26.3)
No	68 (95.8)	66 (88.0)	78 (83.0)	6 (35.3)	218 (84.8)		14 (737)

Values are expressed as *n* (%).
[a]Low-level education: ≤9 years.
[b]Medium level education: 9–12 years.
[c]High-level education: 12 years.
[d]Medical doctor or nurse.
[e]Total percentage may not add up to 100%.

correlated to educational level ($P < 0.05$) with a linear by-linear association. The intention of chewers to quit the habit after the interview was correlated to educational level ($P < 0.05$), however, without a linear by-linear association.

Data of former chewers showed that the most common reason to stop chewing was that the AC habit was considered negative for health (52.6%), negative for oral health (36.8%) and would prevent OC (21.1%). Around 47.4% of former chewers thought that to stop chewing was easy. Only 15.8% of former chewers thought that to stop chewing was difficult.

In addition, data showed that there were 2.448 members of family (so-called 'larger' families including consanguineous connections). Between 2.448 members the number of chewers was 1.406 individuals. From this information it can be concluded that the prevalence of AC in 'larger' families may be about 57%.

Discussion

Data showed that among 257 Areca chewers interviewed, 54.1% were men and 45.9% were women. In another large study from Xiangtan of 3015 Areca chewers (7) the percentage of men compared with women was considerably higher (82.7% vs. 17.3%). In this context it is of interest that the prevalence of OSF in different studies was markedly higher in men than in women. Thus Tang et al. (5) reported OSF ($n = 335$) in 75.2% of men (24.8% women), while Liu et al. (8) reported on OSF in 60.0% of men (40.0% women) in their study of 45 cases with OSF. While these studies seem to indicate a higher prevalence of AC chewing in men further studies are needed to determine the true prevalence of AC in Xiangtan, Hunan province. Of interest was the fact that the number of ex-chewers ($n = 19$) was very low. This shows, that the urge to give-up the AC habit is poorly developed, probably because of lack of sufficient warnings that AC may be hazardous to one's health. Generally, the consumption of Areca products including betel quid (BQ) among men and women vary greatly. In India the prevalence of BQ chewing among different socio-economic groups and among men and women has been studied in limited rural and urban population samples with rather varying results (1). In Taiwan, China, it has been estimated that about 10% of the population of 2 million chew BQ (9), which, however, is of a totally different composition than the one prevalent in Xiangtan, China. In those countries (Thailand, Cambodia, Vietnam, Malaysia) where the BQ-chewing habit is on the decline only elderly women over 55 years of age are still chewing BQ to some extent (10, 11).

The mean age of Areca chewers in this study was 36.1 years with an average period of chewing of 11.2 years. Around 49.8% of Areca chewers in this study were in the age group 19–39 years. If these figures are compared with mean age of patients with OSF, e.g. 38.6 years (5), 40.2 years (7), 34.4 years (12) and 37.6 years (6), it may be assumed that the average period

Table 3 Educational level 276 chewers, reason for chewing and effects

	Chewers n = 257 n (%)						
	Low[a] *education 71 (27.6)*	*Medium*[b] *education 75 (29.2)*	*High*[c] *education 94 (36.6)*	*Medical*[d] *staff 17 (6.6)*	*Total (N = 257)*[e]	*P-value*	*Former chewers (N = 19) N (%)*[e]
Chewing reasons[g]							
Good feeling	34 (47.9)	28 (37.3)	33 (35.1)	6 (35.3)	101 (39.3)		7 (36.8)
Clears up halitosis	12 (16.9)	24 (32.0)	21 (22.3)	2 (11.8)	59 (23.0)		9 (47.4)
Suppresses appetite	3 (4.2)	6 (8.0)	7 (7.4)	4 (23.5)	20 (7.8)		0 (0.0)
Fights nervousness	15 (21.1)	15 (20.0)	25 (26.6)	7 (41.2)	62 (24.1)		1 (5.3)
Fights sleepiness	3 (4.2)	6 (8.0)	5 (5.3)	3 (17.6)	17 (6.6)		1 (5.3)
Makes communication easy	6 (8.5)	13 (17.3)	17 (18.1)	3 (17.6)	39 (15.2)		1 (5.3)
Others	4 (5.6)	3 (4.0)	8 (8.5)	0	15 (5.8)		2 (10.5)
Chewing effects[g]							
Excitement	21 (29.6)	19 (25.3)	31 (33.0)	5 (29.4)	76 (29.6)		4 (21.1)
Happiness	16 (22.5)	16 (21.3)	8 (8.5)	0	40 (15.6)		2 (10.5)
Relaxation	31 (43.7)	32 (42.7)	46 (48.9)	12 (70.6)	121 (47.1)		6 (31.6)
Comfortable feeling	14 (19.7)	19 (25.3)	24 (25.5)	3 (17.6)	60 (23.3)		7 (36.8)
Others	4 (5.6)	3 (4.0)	7 (7.4)	1 (5.9)	15 (5.8)		1 (5.3)
Intention to quit, before[h]							
None	39 (54.9)	35 (46.7)	40 (42.6)	5 (29.4)	119 (46.3)	0.038[f]	
Wanted	32 (45.1)	40 (53.3)	54 (57.4)	12 (70.6)	138 (53.7)		
Intention to quit, future[h]							
Strong	29 (40.8)	21 (28.0)	23 (24.5)	10 (58.8)	83 (32.3)	0.048	
Moderate	33 (46.5)	37 (49.3)	50 (53.2)	4 (23.5)	124 (48.2)		
None	9 (12.7)	17 (22.7)	21 (22.3)	3 (17.6)	50 (19.5)		
Reasons for having stopped chewing[g,i]							
Uncomfortable feeling							4 (21.1)
Bad for health							10 (52.6)
Bad for oral health							7 (36.8)
Prevents oral cancer							4 (21.1)
Saves money							0 (0.0)
Feeling for having stopped chewing[i]							
Comfortable							2 (10.5)
Unhappy							4 (21.1)
No feeling							13 (68.4)
To stop chewing was[i]							
Easy							9 (47.4)
Difficult							7 (36.8)
Very difficult							3 (15.8)

Values are expressed as *n* (%).
[a–e]See Table 2.
[f]Linear-by-Linear Association.
[g]One or two answers could be chosen, total percentage could add up over 100%.
[h]Only for chewers.
[i]Only for former chewers.

of chewing for resulting in OSF may be around 10 years or more, although some young patients with OSF whose AC-chewing period was much shorter than 10 years were reported by Tang et al. (5). The actual time when Areca chewers in Xiangtan take up the habit was difficult to determine from the interviews as many respondents were unable to give a clear answer to this question.

Data further showed that 42.4% of Areca chewers had a smoking habit and 58.0% also had a drinking habit. Both data showed a highly significant difference between men and women with men being smokers and drinkers ($P < 0.001$ for both habits). The fact that 73.2% of respondents chew Areca every day with 61.5% chewing between 3 and 10 Areca pieces adds to the problem of multi-habituation including AC, smoking and alcohol drinking making it a serious health threat for people (men) of Xiangtan.

Of particular interest is that 88.3% of Areca chewers never include the seed ('nut', endosperm) of the Areca fruit. This probably is in contrast to all other BQ-chewing peoples of the entire region where the BQ-chewing habit is prevalent. In a recent review on AC in Mainland China (3) it was shown that the prevalence of OC was low (0.02–0.05%). The prevalence of OC in cases of OSF was 1.2% and 2.6%. Whether the low prevalence figures for OC is because of the different composition of the BQ (excluding the 'nut', betel leaf, lime and tobacco) is unknown. Presently, no studies have been published on the chemical composition of the husk of the Areca fruit.

Usually knowledge and occupation are closely related, however, in the present study we did not focus on profession or occupation in particular. When evaluating data on knowledge of the respondents of side effects it was revealed that 79.0% thought that

AC was detrimental for general health and 85.2% felt that AC was negative for teeth and gums. Data, however, were not significant when correlated to educational level. While these figures clearly indicate that Areca chewers were well informed about side effects they still seemed to adhere to their habit. Only a few studies on knowledge about side effects of BQ-chewing or Areca chewing have been published. Recently, Reichart et al. (11) reported on the knowledge of Thai BQ-vendors, most of which thought that BQC was good for teeth and gums. Knowledge about the association of BQC and OC was extremely poor, with only two of 18 vendors who had heard rumours that there might be such an association. Studies related to knowledge about effects and side effects of BQC among Thai and Cambodian dental and medical students revealed rather poor knowledge about the composition of the BQ, general and oral side effects as well as socio-cultural aspects (13, 14). Poor knowledge in these students may be explained by the fact that the BQ-chewing habit is vanishing from some of the Southeast Asian countries in contrast to Hunan province, where the AC habit is still highly prevalent. Present data also showed that knowledge about stiffness of the oral mucosa, OSF, OC and the relation between OSF and OC increased with the level of education ($P < 0.001$, see Table 2). As might be expected the knowledge was best in members of medical staff ($n = 17$, 6.6% of respondents). In the three other groups (low, medium and high level of education) between 29% and 47.9% had knowledge about stiffness of the oral mucosa, between 39.4% and 58.5% had knowledge about OC, between 4.2% and 17.0% had knowledge about OSF and between 4.2% and 17.0% had knowledge about the association of OSF and OC. These findings indicate that about 50% of respondents did not have adequate knowledge about possible detrimental side effects of their Areca-chewing habits on oral structures. Information on possible health risks when chewing Areca products is urgently needed in the province of Hunan. In addition, intervention studies to make Areca chewers quit the habit are warranted.

The 'positive' effects reported by respondents like feeling good, relaxed, exited or happy are in accordance with what is generally associated with the habit of BQC or AC (1). When asked whether there was any intention to quit the AC habit before the interview those who had a higher educational level had considered this earlier. The intention to quit the habit in the future was significantly different in the educational levels ($P = 0.048$) with those of a higher educational level being more prone to quit than those with a less high-educational level. Obviously the intention to quit was associated with knowledge about negative effects of the AC habit. In fact data from former Areca chewers showed that to stop chewing was not very difficult if health issues were concerned.

The present interviews also included a question about the AC habit in the 'larger' family. About 57% of 'larger' family members were considered to be Areca chewers. This figure cannot be taken for a representative prevalence figure, however, indicates that AC is a habit still widely practiced in Xiangtan, Hunan province. Prevalence figures from other surveys from Xiangtan were variable with 35.4% (2), 64.5% (5), 75.3% (15) and 82.8% (7). These figures indicate that Areca chewing is still a widespread habit in Xiangtan.

Conclusions

Areca chewing and the composition of the 'quid' are markedly different compared with the classical betel quid including the betel leaf, the Areca endosperm, lime and often tobacco. Some few studies indicate that the prevalence of OC seems to be lower compared with other regions where the traditional BQC habit is prevalent. Reasons for this phenomenon are unknown but may be related to the fact that the husk is the main constituent of the 'quid'. Studies on the chemical composition of the husk are urgently needed.

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