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Factors associated with quitting areca (betel) quid chewing

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Abstract – *Objectives:* The purpose of this study was to provide useful data for a future abstinence project by identifying the factors related to quitting areca (betel) quid chewing. *Methods:* The study was cross-sectional. Data on demographic variables, psychological factors and substance-use behaviors were collected via questionnaires from 326 participants. *Results:* Multiple logistic regression analysis indicated that the areca/betel quid chewers who were less educated (OR = 0.58, 95% CI = 0.34–0.98) were least likely to try to give up. Among the chewers who tried to quit, those employed as full-time drivers (OR = 2.24, 95% CI = 1.14–4.39), who had drinking habits (OR = 2.41, 95% CI = 1.24–4.66), and who preferred to chew only betel quid wrapped with leaf (OR = 4.44, 95% CI = 1.99–9.90) were more likely to fail. Chewers who successfully quit had a higher internal health locus of control compared with those who failed to quit (one-point increments, OR = 0.94, 95% CI = 0.90–0.98). *Conclusions:* The results suggest that health educators and researchers can better influence people's chewing behavior if the importance of chewers' education level, job type, substance use (i.e. drinking habits, type of betel quid), and level of health locus of control are all taken into consideration when devising interventions.

Key words: betel quid chewing; quitting; education

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Betel quid chewing is a common behavior in Southeast Asia, Taiwan, India, southern China, the South Pacific islands, northern and eastern Africa, and among immigrants in the UK, other parts of Europe, North America and north-western Australia (1). Approximately 600 million people, almost 10% of the world's population, chew betel quid. It is the world's fourth most frequently used drug after cigarettes, alcohol, and caffeine (2). It is estimated that about 2.5 million residents of Taiwan (17% of the males and 1% of the females) regularly use betel quid (3).

The International Agency for Research on Cancer (IARC) has reported that chewing betel quid with or without tobacco is carcinogenic (4). The rate of oropharyngeal cancer in Taiwan (10.8 per 100 000) is second only to that in India (12.8–23.2 per 100 000) and is much higher than those in Thailand, the Philippines and Singapore (5). This high and growing cancer rate is related to the yearly increase in the incidence of betel quid chewing in Taiwan (6).

Several studies have reported reductions in oral cancer after conducting projects on quitting tobacco and betel quid chewing (7–10). One recent study reported that the elimination of betel quid chewing might prevent 62% of leukoplakia and 26% of malignant transformation to oral carcinoma in Taiwan (11).

Chewing betel quid is deleterious to human health and, as a plant product with psychoactive properties, long-term use of betel quid can lead to betel addiction (12). Moreover, a high percentage of substance abusers suffer from psychiatric disorders (13); therefore, psychological variables such as health locus of control may also be associated with chewing but these are seldom reported.

Various studies on betel quid chewing prevention describe only the withdrawal syndrome (14–17) or projects to prevent combined tobacco and

betel quid chewing by stopping the chewing of tobacco (8, 9, 18). Little information, however, is available on the demonstrated success of interventions in stopping the chewing of betel quid. Part of the reason may be a lack of understanding of the characteristics of betel quid chewers.

The purpose of this study was to provide useful data for a future abstinence project by identifying the factors related to quitting areca (betel) quid chewing.

Methods

Study participants

The study participants were 326 men who were professional drivers (e.g. drivers of trucks, taxis and heavy equipment) in Taiwan, a group at high risk for oral cancer because they chew areca/betel quid. After visiting the drivers' supervisors to explain the purpose of our study and the importance of ceasing betel quid chewing, we asked for the supervisor's permission to conduct the study. The supervisors neither asked their drivers to participate nor prevented them from taking part in the study. Therefore, all participations were voluntary. All the participants had been chewing areca/betel quid more than 1 day per week for at least 1 year. Trained interviewers who administered questionnaires during routine oral health interviews from November 1999 to December 2000 collected the data.

Data collection

All the data for this study were obtained using a questionnaire consisting of demographic, psychological and substance-use variables. Demographic variables such as age, educational level (years of formal education completed), and type of work (driving only or supervisory) were collected.

Each participant also completed the Multidimensional Health Locus of Control (MHLC) scales: the Internal Health Locus of Control (IHLC) scale, the Powerful Other Health Locus of Control (PHLC) scale, and the Chance Health Locus of Control (CHLC) scale (19). The MHLC scales assess psychological variables by determining the participant's perception of who or what is responsible for their individual health, and whether it is an internal or external factor. If a participant's answer is 'oneself', the IHLC score will be relatively high. If an authoritative person such as a spouse, health professional, or significant other (i.e. a powerful other) is named as the agent most responsible for one's health, then the score on the PHLC score will be relatively high. If the participant cites chance or fate, the CHLC score will be relatively high.

In addition, questions were asked about participants' substance use. The 326 participants were divided into three areca/betel quid chewing subgroups according to their chewing and quitting behavior: 'Never tried to quit', 'Successfully quit' (those who had not chewed for at least 6 months up to the date of the study), and 'Failed to quit' (those who had tried but failed to quit for more than half a year in the past). Both the 'Successfully quit' and 'Failed to quit' subgroups were also subsumed within a 'Tried to quit' subgroup vis-à-vis the 'Never tried to quit' subgroup.

We also obtained information on each participant's chewing history: the age when he first began to chew, whether he was a habitual chewer (chewed three times or more per week), the age at which chewing became a habit, and which variety of betel quid was preferred. In Taiwan, the areca/betel quid does not contain tobacco. The two major types of quid are 'Lao-hwa' quid, which is prepared by adding the inflorescence of *Piper betle* extract with slaked lime and some local flavoring into an unripe areca fruit, and 'betel quid', which is made by wrapping an unripe areca fruit and slaked lime paste with a piece of betel leaf. 'Alternating users' found either variety acceptable.

Participants' smoking and drinking behaviors were based on self-reports. Participants were classified as 'regular-smokers' (one cigarette or more per day for at least 1 year at the time of the survey) or 'non-regular-smokers', and as 'regular-alcohol-drinkers' (drinks more than 4 days per week) or 'non-regular-alcohol-drinkers' (drinks fewer than 4 days per week) (20).

Data analysis

Dependent variables

First, all participants were classified as 'Tried to quit' versus 'Never tried to quit'. Second, those who tried to quit were further sub-classified as 'Successfully quit' versus 'Failed to quit'; both classifications were set as dependent variables.

Independent variables

Demographic data, substance-use behavior data (tobacco, alcohol and betel quid use), and MHLC scores were set as independent variables and presented as frequency, percentage, average, and

standard deviation. We grouped these independent variables into the following domains:

1 *Demographic data*, including age (1-years increments); work type (1 = supervisor, 2 = driver); and educational level (1 = equal or less than 9 years, 2 = more than 9 years).
2 *Substance-use behaviors data*, including smoking behavior (1 = non-regular-smokers, 2 = regular-smokers); drinking behavior (1 = non-regular-alcohol-drinkers, 2 = regular-alcohol-drinkers); age at initial chewing (1-year increments); age of habitual chewing (1-year increments); years from initial chewing to habituation (1-year increments); and type of areca/betel quid (1 = Lao-hwa quid only, 2 = alternative of Lao-hwa quid and betel quid, 3 = betel quid only).
3 *MHLC scores*, including the IHLC scale, the PHLC scale and the CHLC scale (all three variables were measured as one-point increments).

To investigate the factors related to willingness to quitting, we estimated logistic model with 'Never tried to quit' as the reference group compared with 'Tried to quit'. To investigate the factors related to success of quitting, we estimated the logistic model with 'Failed to quit' as the reference group compared with 'Successfully quit'.

We calculated odds ratios (OR) and 95% confidence intervals (95% CI) using commercial statistical software (SAS, version 8.02) in the univariate logistic analysis to estimate the magnitude of association between dependent variables and each independent variable separately. We considered variables that were significant at alpha value = 0.05 in the analysis for further evaluation in the multivariate logistic analysis, controlling for age.

Results

In all, 326 participants (mean age, 39.6 ± 10.3 years) were enrolled in the study. Ninety-five were in the 'Never tried to quit' group, and 231 were in the 'Tried to quit' group, all of whom had tried to quit chewing at least once. In the latter group, 114 were in the 'Successfully quit' subgroup and the remaining 117 were in the 'Failed to quit' subgroup.

The demographic data and substance use of all 326 areca/betel quid chewers are shown in Table 1. Areca/betel quid chewers who were older (1-year increments, OR = 1.03, 95% CI = 1.00–1.05) and less educated (OR = 0.50, 95% CI = 0.31–0.82)

Table 1. Demographic data and substance use of areca/betel quid chewers

Variable	Never tried to quit (95) *n* (%)	Tried to quit (231)[b] *n* (%)	Total (326) *n* (%)	Never tried to quit/ Tried to quit [OR[a] (95% CI)]
Age (mean ± SD)	41.7 ± 10.7	38.8 ± 10.1	39.6 ± 10.3	1.03* (1.00–1.05)
Work				
Supervisor	16 (16.8)	56 (24.2)	72 (22.1)	1.00
Driver	79 (83.2)	175 (75.8)	254 (77.9)	1.58 (0.85–2.92)
Education				
≤9 years	51 (53.7)	85 (36.8)	136 (41.7)	1.00
>9 years	44 (46.3)	146 (63.2)	190 (58.3)	0.50* (0.31–0.82)
Regular smoker				
No	15 (15.8)	50 (21.6)	65 (19.9)	1.00
Yes	80 (84.2)	181 (78.2)	261 (80.1)	1.47 (0.78–2.78)
Regular alcohol drinker				
No	18 (18.9)	61 (26.4)	79 (24.2)	1.00
Yes	77 (81.1)	170 (73.6)	247 (75.8)	1.54 (0.85–2.77)
Areca/betel quid chewing, Mean ± SD				
Age at initial chewing	19.6 ± 5.4	20.5 ± 6.0	20.3 ± 5.9	0.97 (0.93–1.02)
Age of habituation	22.1 ± 6.1	23.0 ± 6.5	22.7 ± 6.4	0.98 (0.94–1.02)
Years from initial to habituation	2.7 ± 4.3	2.5 ± 3.5	2.6 ± 3.8	1.02 (0.95–1.09)
Types of areca/betel Quid				
Lao-hwa quid only	15 (15.8)	46 (19.9)	61 (18.7)	1.00
Alternative	38 (40.0)	91 (39.4)	129 (39.6)	1.28 (0.64–2.57)
Betel quid only	42 (44.2)	94 (40.7)	136 (41.7)	1.37 (0.69–2.72)

*$P < 0.05$.
[a]Odds ratio were derived from univariate logistic regression model.
[b]Group 'Ever-tried-to-quit' was consisted of 'Success subgroup' and 'Failure subgroup'.

were least likely to try to quit. The average age of starting to chew was 20.3 ± 5.9 years, and of becoming a habitual chewer, it is 22.7 ± 6.4. The average time it took to become a habitual chewer was 2.6 ± 3.8 years. Regardless of the inclination of habitual chewers to quit chewing, 80.1% of them were regular-smokers, and 75.8% of them were regular-alcohol-drinkers. In Table 2, of the 326 chewers, the highest MHLC scores were on the PHLC scale (50.5 ± 6.9), followed by scores on the CHLC (37.2 ± 8.6) and IHLC (29.2 ± 6.3) scales. There were no significant differences between chewers in the 'Tried to quit' and 'Never tried to quit' groups for the PHLC, IHLC or CHLC, which suggests that chewers tended to believe that healthcare professionals were responsible for their health.

Table 3 reports the demographic data and substance use of chewers who tried to quit. There were no significant differences in average age or education level between the 'Failed to quit' and 'Successfully quit' subgroups. Those who were full-time drivers (OR = 2.03, 95% CI = 1.09–3.76), regular-smokers (OR = 2.15, 95% CI = 1.12–4.10), or regular-alcohol-drinkers (OR = 2.25, 95% CI = 1.23–4.11), and those who preferred only betel quid (OR = 4.22, 95% CI = 1.98–9.00) were more likely to fail to quit chewing. In Table 4, the scores on the three scales of the MHLC show that those in the 'Successfully quit' subgroup scored

Table 2. Scores of Multidimensional Health Locus of Control (MHLC) of areca/betel quid chewers

Variable	Never tried to quit (95)	Tried to quit[b] (231)	Total (326)	Never tried to quit/ Tried to quit [OR[a] (95% CI)]
Internal Health Locus of Control scores (IHLC)	29.5 ± 6.1	29.1 ± 6.4	29.2 ± 6.3	1.17 (0.77–1.63)
Powerful Others Health Locus of Control scores (PHLC)	49.8 ± 6.8	50.7 ± 7.0	50.5 ± 6.9	0.83 (0.58–1.17)
Chance Health Locus of Control scores (CHLC)	37.9 ± 8.4	36.9 ± 8.7	37.2 ± 8.6	1.16 (0.88–1.52)

Values are gives as mean ± SD.
[a]Odds ratios were derived from a univariate logistic regression model.
[b]Group 'Tried to quit' consisted of 'Successfully quit' and 'Failed to quit' subgroups.

Table 3. Demographic data and substance use in areca/betel quid chewers who tried to quit

Variable	Failure (117) *n* (%)	Success (114) *n* (%)	Total (231) *n* (%)	Failure/ Success [OR[a] (95%CI)]
Age (years), mean ± SD	37.6 ± 8.7	40.0 ± 11.3	38.8 ± 10.1	0.98 (0.95–1.00)
Work				
Supervisor	21 (17.9)	35 (30.7)	56 (24.2)	1.00
Driver	96 (82.1)	79 (69.3)	175 (75.8)	2.03* (1.09–3.76)
Education				
≥ 9 years	44 (37.6)	41 (36.0)	85 (36.8)	1.00
>9 years	73 (62.4)	73 (64.0)	146 (63.2)	0.93 (0.55–1.59)
Regular smoker				
No	18 (15.4)	32 (28.1)	50 (21.6)	1.00
Yes	99 (84.6)	82 (71.3)	181 (78.4)	2.15* (1.12–4.10)
Regular alcohol drinker				
No	22 (18.8)	39 (34.2)	61 (26.4)	1.00
Yes	95 (81.2)	75 (65.8)	170 (73.6)	2.25* (1.23–4.11)
Areca/betel quid chewing, mean ± SD				
Age at initial chewing	20.5 ± 6.5	20.5 ± 5.5	20.5 ± 6.0	1.00 (0.96–1.05)
Age at habituation	23.8 ± 6.8	22.1 ± 5.9	23.0 ± 6.5	1.04 (0.99–1.10)
Time to habituation	3.2 ± 4.2	1.6 ± 2.2	2.5 ± 3.5	1.17* (1.05–1.31)
Types of Areca/Betel Quid				
Lao-hwa quid only	14 (12.0)	32 (28.1)	46 (19.9)	1.00
Alternative	42 (35.9)	49 (43.0)	91 (39.4)	1.96 (0.92–4.15)
Betel quid only	61 (52.1)	33 (29.0)	94 (40.7)	4.22* (1.98–9.00)

*$P < 0.05$.
[a]Odds ratios were derived from univariate logistic regression model.

Table 4. Scores of Multidimensional Health Locus of Control (MHLC) of areca/betel quid chewers who tried to quit

Variable	Failure (117)	Success (114)	Total (231)	Failure/ Success [OR[a] (95% CI)]
MHLC Scores				
Internal Health Locus of Control scores (IHLC)	28.2 ± 7.0	30.0 ± 5.6	29.1 ± 6.4	0.63* (0.41–0.96)
Powerful Others Locus of Control scores (PHLC)	51.7 ± 7.1	49.8 ± 6.7	50.7 ± 7.0	1.51* (1.02–2.22)
Chance Health Locus of Control scores (CHLC)	37.6 ± 9.2	36.1 ± 8.1	36.9 ± 8.7	1.21 (0.88–1.64)

Values are given as mean ± SD.
*$P < 0.05$.
[a]Odds ratios were derived from a univariate logistic regression model.

higher (30.0 ± 5.6) on the IHLC scale than those in the 'Failed to quit' subgroup (28.2 ± 7.0) (OR = 0.63, 95% CI = 0.41–0.96), and that those in the 'Failed to quit' subgroup scored significantly higher (51.7 ± 7.1) on the PHLC scale than those in the 'Successfully quit' subgroup (49.8 ± 6.7) (OR = 1.51, 95% CI = 1.02–2.22).

Table 5 reports the results of multivariate logistic regression analysis of factors that affected chewers trying or not trying to quit. Multivariate logistic regression analysis showed that the major factor affecting those trying to quit chewing was education level. The other variables were not associated with the effort of trying to quit. Of those with an education level of 9 years or more, the ratio of those who had never tried to quit to those who had tried to quit was 1:2 (OR = 0.58, 95% CI = 0.33–0.98). This denotes that those with lower education levels were more likely not to quit. Table 6 reports the results of multivariate logistic regression analysis of the factors that affected chewers' trying to quit to success at quitting. Those in the 'Failed to quit' subgroup were more likely to be drivers than supervisors (OR = 2.24, 95% CI = 1.14–4.39), to chew only betel quid rather than Lao-hwa quid (OR = 4.44, 95% CI = 1.99–9.90), and to be regular-alcohol-drinkers (OR = 2.41, 95% CI = 1.24–4.66). Those in the 'Successfully quit' subgroup had higher internal health locus of control scores than those in the 'Failed to quit'

Table 5. Factors that affected effort to try to quit chewing–multivariate logistic regression analysis

Variables	Never tried to quit (95), *n*	Tried to quit (231), *n*	Never tried to quit/ Tried to quit [OR[a] (95% CI)]
Age(years)	41.7 ± 10.7	38.8 ± 10.1	1.02 (0.99–1.04)
Education(years)			
≤ 9	51	85	1.00
>9	44	146	0.58* (0.34–0.98)

*$P < 0.05$.
[a]Odds ratios were derived from a multivariate logistic regression model adjusted for the table's covariates.

Table 6. Factors that affected chewers to quit to success at quitting–multivariate logistic regression analysis

Variable	Failure (117), *n*	Success (114), *n*	Failure/Success [OR (95% CI)]
Age (years)	37.6 ± 8.7	40.0 ± 11.3	0.97 (0.94–1.00)
Work type			
Supervisor	21	35	1.00
Driver	96	79	2.24* (1.14–4.39)
Areca/betel Quid			
Lao-hwa quid only	14	32	1.00
Alternative	42	49	1.61 (0.73–3.54)
Betel Quid only	61	33	4.44* (1.99–9.90)
Internal health locus of control	117	114	0.94* (0.90–0.98)
Regular alcohol drinker			
No	22	39	1.00
Yes	95	75	2.41* (1.24–4.66)

*$P < 0.05$.
[a]Odds ratios were derived from a multivariate logistic regression model adjusted for the table's covariates.

subgroup (OR = 0.94, 95% CI = 0.90–0.98). Although education level was a key factor in participants' trying or not trying to quit, among those who tried to quit, education level was not a factor in their success or failure, nor were age and smoking.

Discussion

In this study, we found that education level was associated with the effort of trying to quit chewing areca/betel quid, but that none of the other background variables contributed significantly to this. Successful quitters of areca/betel quid chewing reported a stronger IHLC. Of the chewers who had tried to quit, those who met one or more of the following criteria were least likely to quit successfully: (i) the subject was a full-time driver, (ii) preferred only betel quid, or (iii) was a habitual drinker.

A study in India (10) found that of those who agreed to attend health education classes and read pamphlets about why they should and how they could quit chewing, 14.3% quit chewing tobacco and areca/betel quid, while those who did not attend quit at the rate of only 4.5%. Another study (21) reported that because more-educated people might have received more information than less-educated people about the negative health effects of areca/betel quid chewing from school and a variety of media, they tended to view areca/betel quid chewing more negatively than did their counterparts. We also found that more-educated chewers were more likely to try to quit than less-educated chewers, which, moreover, supports a similar finding in other research (22). We further compared the group that successfully quit the habit with the group that never tried to quit and found that the less-educated chewers were more likely not to quit (result not shown). Education – both the number of years of schooling completed and supplemental education about the health consequences of chewing betel quid – seems to be an important factor for quitting chewing.

The present study also found that areca/betel quid chewers in both the 'Tried to quit' and 'Never tried to quit' groups scored highest on the PHLC scale. In the 'Tried to quit' group, those in the 'Successfully quit' subgroup had higher IHLC scores than those in the 'Failed to quit' subgroup, and those in the 'Failed to quit' subgroup had higher PHLC scores than those in the 'Successfully quit' subgroup. This finding suggests that 'Successfully quit' subgroup chewers believed that they had a significant amount of control over their health than the 'Failure-subgroup' chewers, who believed that the actions or advice of powerful others, such as healthcare providers, had greater control over their health than they. Other studies have reported similar findings (23). The MHLC hypothesis is that people generally believe that health outcome depends primarily upon (i) chance or fate (CHLC), (ii) powerful others (PHLC), or (iii) personal behavior (IHLC). There is little published data available on the MHLC scores of those who chew areca/betel quid. Those with high IHLC scores would be expected to be more likely than those with low IHLC scores to make an attempt to quit chewing because they are aware of their ability to effect change in their health status and believe their behaviors are the primary determinant of their overall health. However, beliefs about MHLC can be changed by self-education or teaching directed at shifting the health locus of control from external to internal. Our study was cross-sectional and could not differentiate which came first, the belief by members of the 'Successfully quit' subgroup that they had a significant amount of control over their health, or their successful quitting behavior. Whether training to increase the internal locus of control can be beneficial beyond success at quitting betel quid chewing in a brief behavior-modification programme requires further study.

Previous research suggests that alcohol drinking during smoking cessation may decrease treatment success (24). Cigarette smoking was not included in the multivariate logistic regression model because most 'Successfully quit' subgroup and 'Failed to quit' subgroup chewers were also regular-smokers. Our results indicate that the combination of tobacco smoking and alcohol drinking would reduce the possibility of success in quitting areca/betel quid chewing, but that only alcohol consumption was significantly associated with failing to quit chewing.

For drivers and supervisors, areca/betel quid has become a social gesture of friendliness: when chewers meet, they offer each other something to chew in the same way most Taiwanese cigarette smokers offer others a cigarette to show friendliness. Full-time drivers, however, are more likely to use areca/betel quid for its physical effects, such as euphoria, a sense of well-being, reducing tension, heightened alertness, and increased capacity to work (11, 25, 26). In the present study, drivers

tended to fail when attempting to quit chewing, a tendency that might have been influenced by the social environment of drivers and, having to work long hours every day, by their need for the physical effects of chewing.

The first epidemiological study of areca/betel quid chewing in Taiwan reported that chewing areca nut wrapped in betel leaf seemed to be entailing a lesser risk than chewing it with the betel fruit (20). Reports of animal experiments found that betel leaf contains two compounds, eugenol and hydroxycavicol, which are thought to be antimutagenic or anticarcinogenic agents (27, 28). Taiwan's chewers misinterpreted such reports. Based on these reports, they might have believed that wrapped areca/betel quid was safe to chew; therefore, they did not quit chewing. Actually, recent studies have found that ripe or unripe areca/betel quid are both risk factors for liver cancer (29). An effective public health education programme would convey the correct information about areca/betel quid chewing to reduce the incidence of chewing in Taiwan.

Some limitations of this study should be mentioned. First, the cross-sectional design of the study does not allow any conclusions about causality, so the results should be interpreted with caution. Secondly, data may be potentially biased due to the self-reported nature of the information on the amounts of habit-forming substances used. Underreporting is common in such surveys; nevertheless, the findings of a number of investigations indicate that such data can be valid (30).

Another limitation is that all subjects were included from routine oral health interviews in a voluntary fashion if the driver chewed, biasing the sample towards those more susceptible to areca/betel quid chewing quitting. Those non-participants could limit the generalizability of results, which needs to be further studied.

In conclusion, this is the first study in Taiwan we are aware of to document the impact of demographic variables, psychological variables, and substance use on trying to quit chewing. Fewer chewers with lower education levels tried to quit than those with higher levels. Furthermore, of the chewers who had tried to quit, those who (i) were full-time drivers, (ii) preferred only betel quid, or (iii) were habitual drinkers were least likely to be successful at quitting. Health educators and researchers who wish to influence people's areca/betel quid chewing behavior need to be made aware of the importance of chewers' educational level and health locus of control as well as their job type and substance use patterns.

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