



OPEN A cross-sectional study on the knowledge, attitudes and practice of chewing areca nut and its risk factors among college students

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Chewing areca nut is common in many nations. However, chewing areca nut may do more harm than good. We aimed to figure out the knowledge, attitudes, and practices of areca nut chewing among college students. An online cross-sectional survey was conducted among students at Central South University in Changsha in March 2023. The questionnaire included three parts: general characteristics, knowledge and attitudes toward areca nut chewing, usage and addiction to areca nut. Chi-square analysis was employed to compare the basic statistics and other characteristics of the areca nut chewing group and the non-chewing group. Binary logistic regression analysis was conducted to examine the effect of students' basic statistical information on areca nut chewing. Our study included 1417 participants in total. The mean age of the group was 21.35 years (SD=1.62), which included 715 males (50.5%) and 702 females (49.5%). According to the survey, 317 students (22.4%) chewed areca nut as a habit; including 37.9% males and 6.6% females ($p < 0.05$). The results of binary logistic regression analysis showed a negative correlation between higher academic year and having siblings with the likelihood of a student using areca nut, while increasing age, male sex and having higher educational level of parents were positively associated with areca nut chewing. Of the participants, 57.6% thought there was no benefit from chewing areca nuts. 73.7% acquired knowledge about areca nut's health effects through TV or the internet. Gender, academic year, parental education level, and not being an only child may affect the habit of areca nut chewing among college students. The binary logistic regression analysis in this study found that gender, academic year, parental education level, and not being an only child may affect the habit of areca nut chewing among college students. Among all participants, the majority of students believed that areca nut had addictive substances and carcinogenicity, and most of them agreed that oral cancer can be prevented.

Keywords Areca nut, University students, Knowledge and attitudes, Risk factors

Abbreviations

BQ	Betel quid
OR	Odds ratio
OSCC	Oral squamous cell carcinoma
OSF	Oral submucous fibrosis
POLHN	Pacific Open Learning Health Net
SD	Standard deviation

The areca nut is commonly referred to as betel nut, because it is often chewed while wrapped in betel leaves¹. Betel quid (BQ) and areca nuts products are typically a mixture of areca nuts and hydrated lime wrapped in

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betel leaves with added flavorings². All throughout the world, about 600 million people are areca nut users^{3,4}. In China, Hunan Province has one of the highest prevalence rates (64.5–82.7%) of areca nut chewing⁵. A major reason for this is that Xiangtan in Hunan Province is a major centre for areca nut processing. Moreover, The BQ chewing habit in Hunan consists of dried husks and areca nuts, which are sold as industrially packaged, areca nut-based products. The age range of people chewing areca nut in Hunan is very wide. A study investigated the chewing of areca nut among primary and secondary school students in Hunan Province and found that the frequency of chewing areca nut was 12.4%⁶.

As an important herbal medicine, areca nut exhibits therapeutic potential for a wide range of illnesses, including depression, abnormalities of the digestive system, and parasitic infections^{7–10}. However, many studies have shown that the ingredients of areca nut are potentially harmful^{11,12}. Adverse effects of chewing areca nut include cytotoxicity and genotoxicity, carcinogenicity (especially oral cancer), oral submucous fibrosis (OSF), and addiction dependence^{7,8,13–15}. Areca nut has been classified as an independent Group 1 human carcinogen¹⁶. BQ chewing is closely associated with oral precancerous lesions, leukoplakia and OSF and has exhibited significant dose response¹⁷. However, according to the results of a survey in Hunan Province published in 2008, most respondents did not know that chewing areca nut could induce oral cancer¹⁸.

Due to the prevalence of areca nut chewing in Hunan Province, China, the incidence of oral cancer is particularly high, posing a serious threat to public health^{19–21}. Few studies have explored the current situation of areca nut chewing among university students and their perceptions and attitudes towards areca nut²². The aim of our study was to figure out how often the students use areca nut or areca nut products at Central South University in Changsha, Hunan, as well as to identify any potential risk factors.

Methods

Participants and study design

In this cross-sectional study, we distributed an anonymous self-reported questionnaire to students of Central South University in Changsha by sending links to class groups or club groups on WeChat (the dominant social platform among Chinese college students) in March 2023. We compiled the items in our questionnaire to make them relevant to our research population based on prior studies^{23,24} and the epidemiology of areca nut usage in China²⁵. Surveys were administered via Questionnaire Stars (www.wjx.cn), a certified online data collection platform compliant with China's cybersecurity regulations (GB/T 35273 – 2020). Participants accessed the survey through unique links. Upon accessing the link, participants first viewed a mandatory disclosure statement: “Dear student, thank you for participating in this survey on areca nut use among contemporary university students. Your responses will be used solely for academic research. All data are anonymized; no personal identifiers (e.g., name) are collected. You may close the browser at any time to withdraw. Submission of this questionnaire implies informed consent. We appreciate your honest and careful responses.” The exclusion criteria are as follows: (1) incomplete questionnaire, (2) the duration of questionnaire filling without under 60 s. If a questionnaire met any of the exclusion criteria, it would be unaccepted.

Materials

The questionnaire was called *College students' knowledge, attitudes and use of areca nut*. The questionnaire included three parts: general characteristics, knowledge and attitudes toward areca nut chewing, usage and addiction to areca nut. This questionnaire consisted of 42 items (the Supplemental Data 1). General characteristics included age, gender, academic year, and cost of living per month, etc. An extra 15 questions were listed to discover more about respondents' knowledge and attitudes toward areca nut chewing. Then we asked the students the following question, “Do you have a tendency to chew areca nut?”. When participants chose “Yes”, they were required to answer further 19 questions designed to gauge the respondents' usage of areca nut. If they replied “No”, questions about the use of areca nut would be skipped.

Statistical analysis

The invalid questionnaires were excluded on the platform of Questionnaire Stars. The final data was then downloaded and analyzed in SPSS (version 26.0). The qualitative data are described as frequencies and percentages (%), while quantitative variables are described as means and standard deviations (SD). Chi-square analysis was employed to compare the basic statistics and other characteristics of the areca nut chewing group and the non-chewing group. Continuous variables were compared with the Student's t-test. Binary logistic regression analysis was conducted to examine the effect of students' basic statistical information on areca nut chewing. In this logistic regression analysis, areca nut chewing is regarded as a dependent variable, while gender, age, and other basic characteristics were considered as covariates. The statistical significance of the study was determined at *p*-value less than 0.05, and the test of significance used was two-sided. In addition, “Generally agreed”, “Relatively agreed”, and “Completely agreed” were considered as agreed.

Results

Basic characteristics of the participants

1692 questionnaires were returned in total. After excluding incomplete questionnaires and short questionnaires (less than 60 s), 1417 questionnaires (83.74%) remained. There were 715 males (50.5%) and 702 females (49.5%), with a mean age of 21.35 years (SD = 1.62). A total of 317 participants (22.4%) reported a habit of areca nut chewing. Among them, 271 (85.5%) were males and 46 (14.5%) were females (*p* < 0.05). They varied across academic years, with percentages of 29.30% among freshmen, 48.10% among sophomores, 23.3% among juniors, 9.40% among seniors, and 5.1% among graduate students (*p* < 0.05). A statistically significant difference was observed in areca nut chewing prevalence between medical students (27.9%) and non-medical students

(15.7%) ($p < 0.05$), only children (34.4%) and non-only children (12.6%) ($p < 0.05$) and between urban students (26.3%) and rural students (17.3%) ($p < 0.05$). Besides, a noteworthy association was identified between parental education level ($p < 0.05$), as well as family atmosphere ($p < 0.05$), and areca nut chewing behavior. However, there was no significant difference in the proportion of chewing areca nut among students with different monthly living expenses ($p = 0.29$). In addition, since it is mainly men who chew areca nut, we conducted a stratified analysis of the differences in areca nut chewing among men with different home residence and found that there were no significant differences in areca nut chewing among men with different home residence ($p = 0.05$). Table 1 presents the basic characteristics of all the participants and as chi square analysis of the variations among groups.

The habit of areca nut chewers

Among the study participants who chewed areca nut, 143 (45.1%) began chewing areca nut at an age younger than 18 years, and almost half of the participants had chewed areca nut for 2–3 years ($n = 158$, 49.8%). Most of the areca nut chewers chew 3–5 areca nuts per day ($n = 113$, 35.6%), followed by 6–8 areca nuts per day ($n = 99$, 31.2%), and 36 people chewed 9 or more areca nuts per day (11.4%). 143 areca nut chewers chew areca nut for 30 min to an hour daily (45.1%), and 103 (32.5%) spent 20 to 50 yuan on chewing areca nut in the past six months. Figure 1 shows the characteristics of the habit of areca nut chewers.

Basic characteristics	Areca nut use		Chi-square		Total (%)
	Yes (%)	No (%)	χ^2 / t	p Value	
N	317 (22.4)	1100 (77.6)			1417 (100)
Gender			200.46	<0.05	
Female	46 (6.6)	656 (93.4)			702 (49.5)
Male	271 (37.9)	444 (62.1)			715 (50.5)
Age	21.55 ± 1.82	21.29 ± 1.55	2.32	<0.05	21.35 ± 1.62
Academic year			173.68	<0.05	
First year	44 (29.3)	106 (70.7)			150 (10.6)
Second year	128 (48.1)	138 (51.9)			266 (18.8)
Third year	95 (23.3)	312 (76.7)			407 (28.7)
Fourth year	43 (9.4)	414 (90.6)			457 (32.3)
After the fourth year	7 (5.10)	130 (94.9)			137 (9.7)
Monthly cost of student's living			2.45	0.29	
<1000yuan	34 (25.4)	100 (74.6)			134 (9.5)
1000–2000yuan	226 (21.4)	832 (78.6)			1058 (74.7)
>2000yuan	57 (25.3)	168 (74.7)			225 (15.9)
Whether the only child			95.35	<0.05	
Yes	218 (34.4)	416 (65.6)			634 (44.7)
No	99 (12.6)	684 (87.4)			783 (55.3)
Home residence			16.24	<0.05	
Urban	209 (26.3)	585 (73.7)			794 (56.0)
Rural	108 (17.3)	515 (82.7)			623 (44.0)
Home residence (Male)			3.83	0.05	
Urban	178 (59.3)	259 (40.7)			437 (61.1)
Rural	93 (66.5)	185 (33.5)			278 (38.9)
Parents' education level			51.94	<0.05	
Primary school	14 (9.4)	135 (90.6)			149 (10.5)
Secondary school	67 (14.8)	387 (85.2)			454 (32.0)
High school	128 (29.5)	306 (70.5)			434 (30.6)
College	96 (27.6)	252 (72.4)			348 (24.6)
Postgraduate	12 (37.5)	20 (62.5)			32 (2.3)
Family atmosphere			15.30	<0.05	
Very harmonious	135 (27.4)	357 (72.6)			492 (34.7)
Harmonious	98 (17.4)	464 (82.6)			522 (36.8)
Generally harmonious	67 (23.3)	221 (76.7)			288 (20.3)
Not quite harmonious	13 (22.4)	45 (77.6)			58 (4.1)
Not harmonious	4 (23.5)	13 (76.5)			17 (1.2)

Table 1. Basic characteristics of participants in this study.

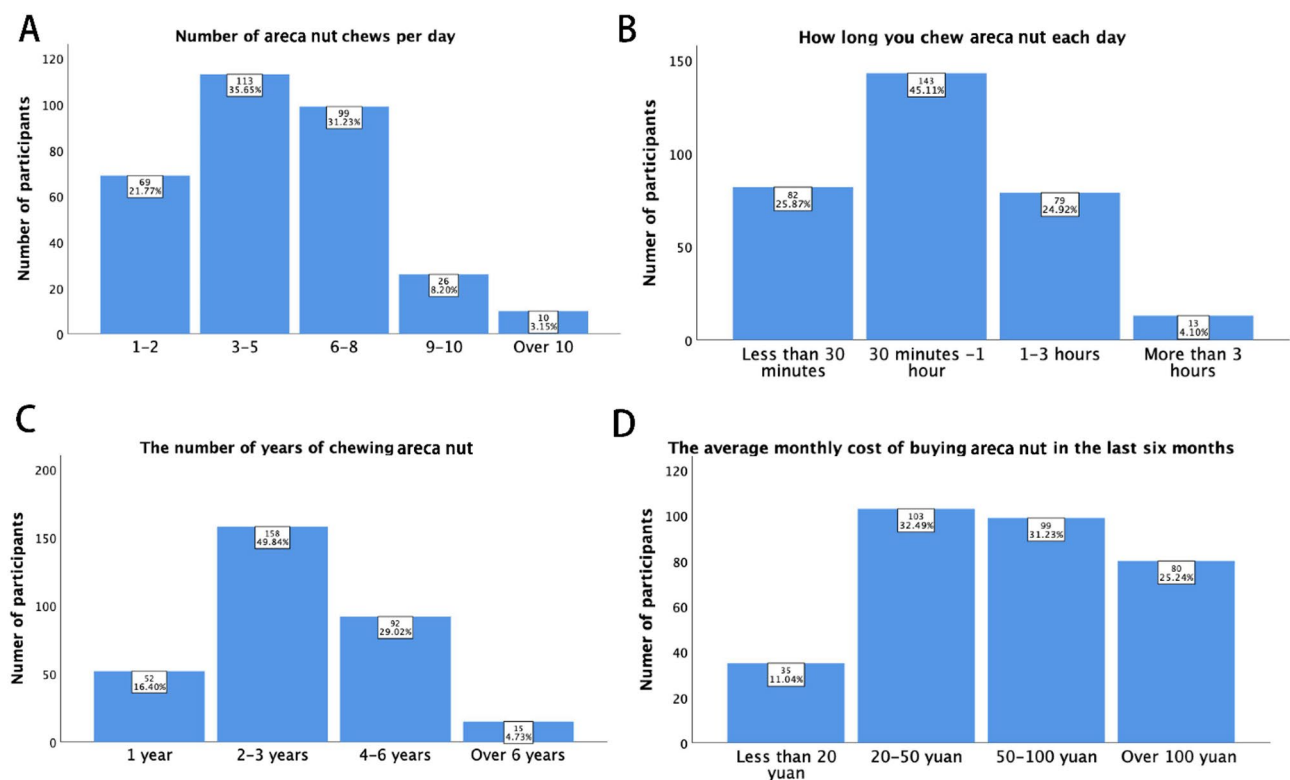


Fig. 1. The habits of areca nut chewers. (A) Number of areca nut chews per day. (B) How long you chew areca nut each day. (C) The number of years of chewing areca nut. (D) The average monthly cost of buying areca nut in the last six months.

	B	Wald	p value	OR	95% CI	
					Lower	Upper
Age	0.38	45.97	<0.05	1.46	1.31	1.63
Gender	1.67	82.60	<0.05	5.31	3.70	7.61
Academic year	-0.98	123.44	<0.05	0.38	0.32	0.45
Whether the only child	-0.91	28.18	<0.05	0.40	0.29	0.57
Home residence	0.01	0.00	0.95	1.01	0.71	1.45
Parents' education level	0.27	8.98	<0.05	1.31	1.10	1.57
Family atmosphere	0.07	0.69	0.41	1.07	0.91	1.26

Table 2. Bivariate logistic regression analysis of ever areca nut use.

Risk factors of chewing areca nut

The results of bivariate logistic regression analysis (Table 2) showed that home residence ($p=0.95$) and family atmosphere ($p=0.41$) had no significant effect on areca nut chewing. Meanwhile, increasing age (OR = 1.46, 95%CI: 1.31–1.63, $p<0.05$), male sex (OR = 5.31, 95%CI: 3.70–7.61, $p<0.05$), and higher parents' education level (OR = 1.31, 95%CI: 1.10–1.57, $p<0.05$) were positively correlated with students' use of areca nut. In addition, having siblings (OR = 0.40, 95% CI: 0.29–0.57, $p<0.05$), and being in a higher academic year (OR = 0.38, 95% CI: 0.32–0.45, $p<0.05$) were negatively correlated with the likelihood of a student using areca nut.

Reasons for chewing areca nut

We designed a multiple-choice question (with a maximum of three options) to analyze the reasons why college students chew areca nut. The results showed that the majority of people chose to chew areca nut simply because of its good taste ($n=190$). Secondly, environmental factors (including crowd mentality and social needs) accounted for the second major reason for chewing areca nut. Additionally, some people chew areca nut to refresh their minds ($n=149$). Chewing areca nut has become a daily habit for 129 participants. Other factors contributing to chewing betel nuts include health benefits, keeping warm and quenching thirst (Fig. 2).

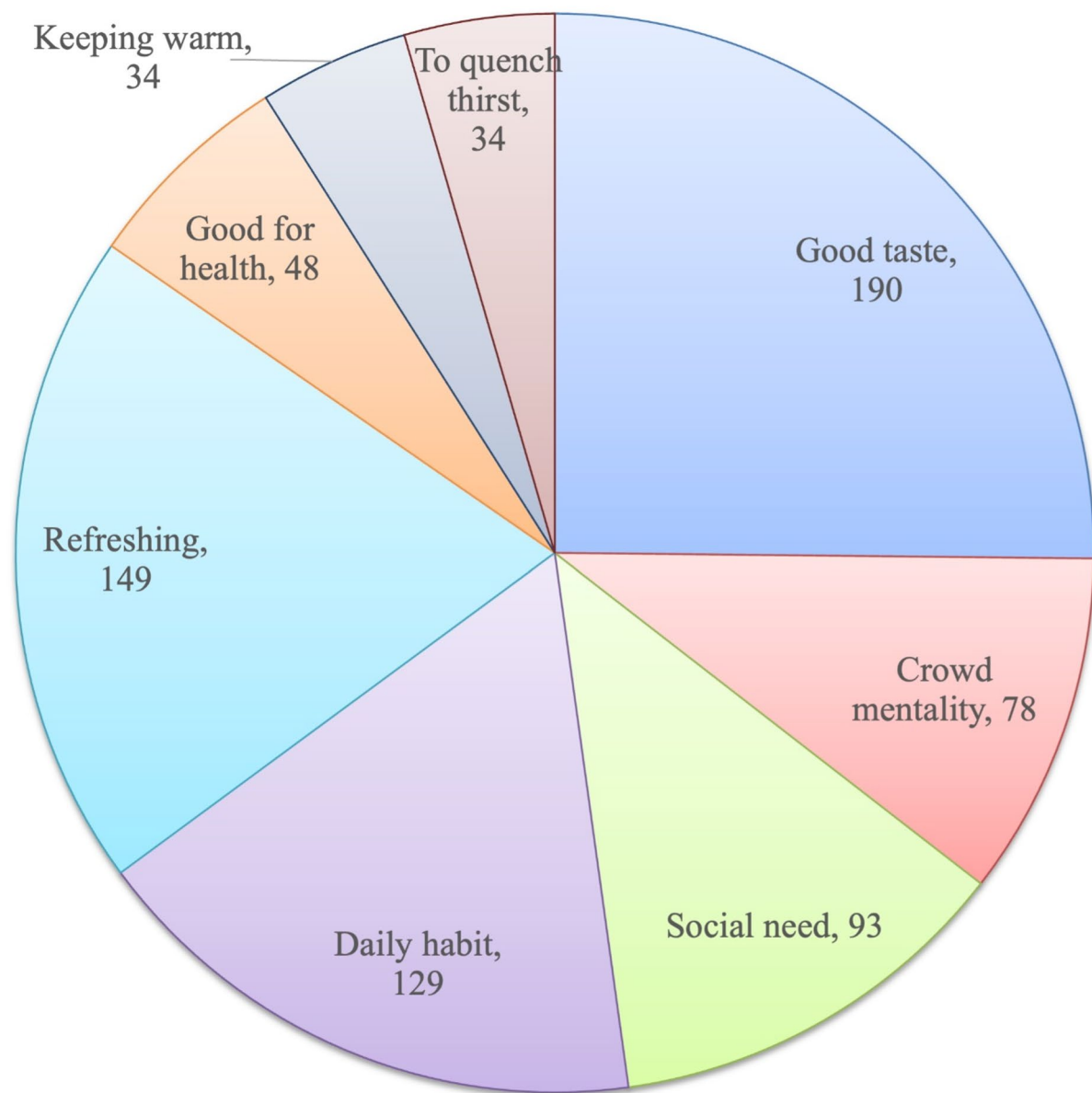


Fig. 2. Reasons for chewing areca nut.

Cognition and attitudes toward areca nut

The third part of questionnaire aimed to collect knowledge and attitudes toward areca nut. As many as 57.6% of the participants held the belief that chewing areca nut did not provide any benefits. Also, 74.3% of the respondents were aware of the World Health Organization's classification of areca nut as a Group 1 carcinogen. A full 84.3% of respondents perceived a correlation between chewing areca nut and oral cancer, with 59.1% attributing the presence of the carcinogenic substance to areca nut itself. A substantial percentage (75.5%) conveyed their thought that oral cancer could be prevented. Additionally, 52.1% of individuals believed that areca nut possessed addictive properties. Most students thought using areca nut would produce the following undesirable outcomes: oral mucosal ulcer (69.2%), impaired taste function (63.6%), restriction of mouth opening (58.3%), cancer of oral mucosa (71.3%), and serious tooth abrasion (65.1%). It is significant that 73.7% of them obtained information on health risks of areca nut through TV or Internet. In addition, 50.3% of the students considered that teenagers should be banned from chewing betel quid. To some extent, most participants thought areca nut advertisements should be forbidden and all shops or supermarkets selling areca nut need to be regulated. However, only 30.4% fully agreed that they would persuade those around them not to chew areca nut or to chew less. Further details were presented in Table 3.

Items	Frequency (%)
I think chewing areca nut has the following benefits.	
Antibacterial and deworming effect	127 (9.0%)
Relieve mental stress and refresh	433 (30.6%)
Soothe qi and stomach, relieve pain and eliminate accumulation	273 (19.3%)
Prevention of cardiovascular and cerebrovascular diseases	192 (13.5%)
Others	36 (2.5%)
No benefit	816 (57.6%)
I know that the World Health Organization classifies areca nut as a Group I carcinogen.	
Yes	1053 (74.3%)
No	216 (15.2%)
Not sure	148 (10.4%)
I think areca nuts can cause cancer in part	
Betel leaf	632 (44.6%)
Part of tobacco	718 (50.7%)
Areca nut	837 (59.1%)
Part of lime	537 (37.9%)
Others	20 (1.4%)
I don't know	330 (23.3%)
I know that chewing areca nut is associated with oral cancer	
Yes	1195 (84.3%)
No	150 (10.6%)
Not sure	72 (5.1%)
I know that oral cancer can be prevented	
Yes	1070 (75.5%)
No	178 (12.6%)
Not sure	169 (11.9%)
I think oral cancer can be cured.	
Totally not agreed	210 (14.8%)
Not quite agreed	569 (40.2%)
Generally agreed	411 (29.0%)
Relatively agreed	178 (12.6%)
Completely agreed	49 (3.5%)
What I think is addictive about areca nut and its products.	
The areca nut itself	738 (52.1%)
Additive components	420 (29.6%)
Not addicted	102 (7.2%)
I don't know	157 (11.1%)
I think chewing areca nut is an unhealthy behavior.	
Totally not agreed	83 (5.9%)
Not quite agreed	150 (10.6%)
Generally agreed	170 (12.0%)
Relatively agreed	388 (27.4%)
Completely agreed	626 (44.2%)
I think eating areca nut can produce the following oral hazards.	
Oral mucosal ulcers	980 (69.2%)
Impaired taste function	901 (63.6%)
You can't open your mouth	826 (58.3%)
Canceration of the oral mucosa	1011 (71.3%)
Severe tooth wear	923 (65.1%)
I don't know	97 (6.8%)
No harm	13 (0.9%)
I got my knowledge of areca nut from the following ways.	
Friends	544 (38.4%)
Newspapers or magazines	641 (45.2%)
Television and the Internet	1044 (73.7%)
Continued	

Items	Frequency (%)
Books or school programs	619 (43.7%)
Brochures or posters	400 (28.2%)
Others	74 (5.2%)
I would advocate to the people around me not to chew areca nut or less	
Totally not agreed	86 (6.1%)
Not quite agreed	142 (10.0%)
Generally agreed	346 (24.4%)
Relatively agreed	412 (29.1%)
Completely agreed	431 (30.4%)
When someone has oral cancer, I think he/she should seek medical treatment.	
Totally not agreed	62 (4.4%)
Not quite agreed	128 (9.0%)
Generally agreed	156 (11.0%)
Relatively agreed	336 (23.7%)
Completely agreed	735 (51.9%)
I think teenagers should be banned from chewing areca nut.	
Totally not agreed	44 (3.1%)
Not quite agreed	122 (8.6%)
Generally agreed	210 (14.8%)
Relatively agreed	328 (23.1%)
Completely agreed	713 (50.3%)
I think areca nut advertisements should be banned or restricted in the major media.	
Totally not agreed	52 (3.7%)
Not quite agreed	141 (10.0%)
Generally agreed	272 (19.2%)
Relatively agreed	343 (24.2%)
Completely agreed	609 (43.0%)
I think all kinds of shops or supermarkets that sell areca nut should be regulated.	
Totally not agreed	62 (4.4%)
Not quite agreed	114 (8.0%)
Generally agreed	272 (19.2%)
Relatively agreed	368 (26.0%)
Completely agreed	601 (42.4%)

Table 3. Knowledge and attitudes regarding areca nut among university students.

Discussion

This cross-sectional study focused on the knowledge, attitudes, and practices of chewing areca nut among Central South University students in Changsha, Hunan. According to the survey, we found that male students were more likely to have areca nut compared with female students, which was consistent with previous studies^{26–29}. Young and adult women might not enjoy it since areca nut stained teeth, thus affecting aesthetics. We also found that with the improvement of students' grades, the use of areca nut in college students decreased significantly. This may reflect increased autonomy in health decisions or exposure to oral health courses.

In addition, only children were more likely to chew areca nut than non-only children. One possible explanation may be that the only child bears more attention from the parents, and the pressure of life and study is greater than that of a non-only child. In our survey, 76% of students using areca nut reported that there were other people who chewed areca nut nearby them. Students were more likely to chew areca nut if they were unable to refuse areca nut supplied by family or friends in previous research^{27,30}. Meanwhile, chewing areca nut was considerably influenced by home address according to the chi-square analysis in our study. Among the students chewing areca nut, 66% of them were from metropolitan areas. However, when we conducted a stratified analysis of men with different home residences, no significant statistical differences were found. The logistic regression analysis also revealed a contradictory result that there was no statistical significance about the role of home address on areca nut chewing. We suspect that it is because the chi-square analysis did not control for the percentage of males in urban and rural areas, but our logistic regression did. Therefore, logistic regression shows the real situation. According to an Indian study with a sample size of 74,037 individuals aged 15 and older, consumption of areca nut was higher in urban than in rural areas²⁶. Conversely, another survey discovered that areca nut chewing was more common in less urbanized areas²⁸. Future multi-regional studies should examine how variations in areca nut product types and location-specific accessibility influence consumption patterns. Furthermore, our survey

supported that as parents' education levels rose, their children obtained more chances to chew areca nut. This might be due to the phenomenon that the higher the education levels the parents had, the greater the expectations of the parents exerted on their children. As the stress on the children became greater, they were more likely to chew areca nut for psychological comfort. It has been found that areca nut users often experience emotional distress, such as anxiety, depression, and distress related to areca nut dependence³¹. Therefore, reducing the burden on college students is critical, while we also advocate that students relieve their stress more healthily by developing other interests or playing sports. A higher rate of areca nut chewing was observed in studies with children with parents experiencing failed marriages²⁴. In addition, if either of the parents chewed areca nut, it was easier for their children to pick up this habit as teenagers^{32–35}.

In our study, the level of knowledge among these students regarding areca nut and oral cancer was high. The World Health Organization defines areca nut as a Group 1 carcinogen, and more than two-thirds of the participants (74.3%) were aware of this fact. This was significantly higher than that of the results from another survey in China, revealing that only 30.6% of participants recognized areca nut's carcinogenicity²⁰. However, there were still a large number of participants choose to chew areca nut. We believe there are three mutually reinforcing driving factors: Firstly, Hunan province is the largest processing area of areca nut in the country, which makes it very easy for people to purchase areca nut. Secondly, peer pressure also plays an important role. Crowd mentality and social needs constitute a large part of the reasons why people chew areca nuts. Last but not least, the underestimation of addiction is also a very important part: although 84.3% of people are aware of oral cancer risks, there were still 40.6% of participants chew areca nut due to their daily habit. This suggests knowledge alone is insufficient where environmental exposure and social reinforcement are pervasive. Unlike previous studies that revealed a low level of knowledge regarding the carcinogenic effects of areca nut^{35,36}, 84.3% of participants in our study were aware that areca nut was associated with oral cancer and 75.5% of them realized that oral cancer could be prevented. It may be because oral cancer was widespread as reported in scientific research. According to the results of a cluster-randomized controlled trial, oral visual screening could be a worthwhile initiative for oral cancer surveillance, and the screening had the potential to decrease the mortality of oral cancer^{17,37}. In addition, it could be the primary prevention effort to reduce areca nut use. However, there were many barriers to oral mucosal screening, including a lack of a physician recommendation, high cost and lack of public transport, emotional barriers (avoidance of cancer information and fear), embarrassment, fear of the procedure or report, living in a rural area, and insufficient resources^{38–40}. What's more, a systematic review and meta-analysis including 11 studies indicated that betel quid and areca nut chewing was closely associated with poor prognosis of patients with oral cancer¹⁹. Unlike the warning labels on tobacco products by the Tobacco Products Directive (from the WHO Framework Convention on Tobacco Control)⁴¹, many areca nut product packaging or sale websites provide no information about the carcinogenic effects and risks of oral cancer. It might be difficult to get the support of the government to control arecanut because it may be earning taxes from arecanut products, but is important to keep trying hard⁴².

In terms of how participants perceived the addictive properties of areca nut and its products, 52.1% of participants believed that the areca nut itself was addictive, while 29.6% thought that the added substances were. It has been found that there are seven psychoactive alkaloids in the areca nut with arecoline being the main one, and the rest are arecaine, guvacine, guvacoline, isoguvacine, arecolidine, and homoarecoline^{43,44}. Arecoline was supposed to be the principal hazardous component in areca nuts, and its primary side effects were genotoxicity, oral submucous fibrosis, and oral squamous cell carcinoma (OSCC)⁴⁵. In the aspect of the oral hazards of consuming areca nut, the majority (71.3%) of the students chose oral mucosa cancer and more than half of the students chose oral ulcer (69.2%), severe tooth wear (65.1%), gustatory dysfunction (63.6%), or hard to open the mouth (58.3%). Our results showed that college students had a certain awareness of the oral hazards of chewing areca nut. Some previous studies found a higher prevalence of dental caries and oral candida in BQ users than in non-users^{46,47}. Community-based oral care education should also be warranted to improve oral health and oral hygiene⁴⁸. As the results of a global systematic review based on 62 studies, the brain, heart, lungs, gastrointestinal tract, and reproductive systems were among nearly all of the human body's organs that were affected by areca nut consumption²⁰. There is a pressing need for policymakers to acknowledge areca nut as a dangerous food ingredient. To control the commercial manufacturing of areca nuts, strict restrictions are required. Chewing areca nut can also disrupt basic medical procedures, such as tracheal intubation and preoperative airway assessments due to oral submucous fibrosis caused by areca nut chewing⁴⁹.

There are many ways to know about the health hazards of areca nut. According to the findings of our survey, most participants (73.7%) received health-related information about areca nut from television and the Internet. This suggested that the ways to spread knowledge about areca nut could be in line with the preference of contemporary young people who were more inclined to receive knowledge through video. Some platforms offer online courses about the dangers of betel quid and areca nut, such as the Pacific Open Learning Health Net (POLHN)⁵⁰. It has the potential to be adopted in China and other countries to improve the understanding of areca nut in student groups. Moreover, health education enables students to better resist the use of areca nut. A study was designed to explore the effect of preventive health education intervention in the knowledge, attitudes, practice of areca nut chewing, and self-efficacy in resisting areca nut chewing for adolescent students. It confirmed the importance of health education programs in dealing with the health risks of areca nut chewing for the risk group students⁵¹. All these results can guide us to design a well-fitting publicity campaign about the hazards of areca nut for students in the future and educational intervention measures on how to stop using areca nut.

The results of our study also indicated that college students maintained a relatively consistent view towards the dimension of supervision and restriction of areca nut. The majority of the participants held the positive attitude towards banning or restricting chewing areca nut by teenagers (73.4%), areca nut advertisements in major media (67.2%) and selling areca nut in shops or supermarkets (87.2%), suggesting that college students

were looking forward to strengthening the restriction of areca nut use. Moreover, a large amount of online data demonstrated that the general public held a negative attitude toward the chewing habit. According to the findings of the questionnaire from residents in Zhuzhou City, most of the responders (74.3%) suggested that controlling and managing areca nut industries was necessary²⁰. Under such a context, the government needs to formulate appropriate policies to balance public proposals, suggestions and areca nut industry development.

There are several limitations in our study. Firstly, the sample size of our study was limited, so the results might not be representative of Chinese university students. Secondly, online surveys may be more difficult to ensure data quality compared with face-to-face interviews. That might cause the main information bias of our study.

Conclusion

The binary logistic regression analysis in this study found that gender, academic year, parental education level, and being an only child may affect the habit of areca nut chewing among college students. Among all participants, the majority of students believed that areca nut had addictive substances and carcinogenicity, especially for oral cancer, and most of them approved that oral cancer can be prevented.

Data availability

All data generated or analysed during this study are included in this published article [and its supplementary information files].

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Author contributions

Jiafen Liao: Writing - Original Draft & Review, Formal analysis, Investigation, Project administration, Conceptualization; Shan Xiong: Writing original draft, Formal analysis, Investigation, Project administration; Zhouyou Tang: Writing original draft, Formal analysis, Investigation, Project administration; Jiayao Lan, Writing original draft, Formal analysis, Investigation, Project administration; Xiaofei Peng, guided the analysis of the data; Jin Kang, guided the analysis of the data; Qi Tang, modified the grammar and provided writing guidance; Jia Wang, Conceptualization and providing overall guidance. All authors reviewed the manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

The study was designed in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee of Second Xiangya Hospital of Central South University. It is designed as a questionnaire survey, with participants providing informed consent to take part in the research.

Additional information

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