A Survey of Areca (Betel) Nut Use and Oral Cancer in the Commonwealth of the Northern Mariana Islands

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Abstract

Areca nut use is a cause of higher rates of oral cavity cancer in the Commonwealth of the Northern Mariana Islands (CNMI). Little is known about patient insights into the risks of areca nut use worldwide. The purpose of this study is to evaluate perceptions of areca nut use and oral cancer among chewers in the CNMI. This is a survey study undertaken at the CNMI's only regional health center—300 adult participants completed a 21-question survey that assessed demographics, chewing behaviors, perceptions of areca nut use and oral cancer, and the willingness to participate in cessation and screening programs. Data was analyzed using chi-squared tests, at a significance value of P < *.05. The participant average age was 38, and 41% were male. Almost all (92%) knew that chewing areca nut causes oral cancer, but only 13% correctly identified the actual areca nut as a carcinogen. About half (59%) believed that oral cancer could be treated. Most people (74%) were willing to participate in screening programs for oral cancer. Those who chewed areca nut daily were more likely to be interested in medicated replacement products relative to those who chewed less frequently (*P = *.048). In conclusion, there are drastic misperceptions about areca nut and oral cancer in the CNMI. Efforts should be made towards promoting awareness of the carcinogenicity of the actual areca nut, and the treatability of oral cancer. Mandated educational warnings should be required with areca nut sales. Further research evaluating substitution methods and screening programs is indicated.*

Keywords

survey, perception, areca nut, oral cancer, Micronesia

Introduction

Areca nut is the commonly chewed fruit of the betel palm (*Areca catechu*), widely cultivated in Asia and the Pacific Islands.[1] There are many documented reasons for chewing, including sympathetically-mediated feelings of increased alertness, stamina, and hunger-suppression, which have contributed to the popularity of areca nut in many cultures throughout the Asia-Pacific region.[2] Now classified as a Group 1 carcinogen by the International Agency for Research on Cancer, areca nut contributes to the elevated rates of oral cancer throughout this region.[3-5] Of particular interest is areca nut use in the Pacific Islands, as regions in Micronesia have been shown to have a potentially increasing incidence of oral cancers.[6-8]

The Commonwealth of the Northern Mariana Islands (CNMI) is a group of islands in the western Pacific Ocean that are inhabited by a population predominantly of Asian Pacific Islander (API - Chamorro, Carolinian, or Other Pacific Islander) or other Asian heritage.[9] Saipan, the capital of the CNMI, represents the largest of these islands and has a population of roughly 50,000 people.[10] Prior studies from this region have explored chewing behaviors in various regards.[11,12] For example, the nut may be chewed ripe or unripe, by itself, or in a combination with tobacco and/or lime.[13] Differences in chewing habits vary geographically throughout Micronesia and are thought to be due in part to acculturation as a result of variable migration patterns throughout the years.[14] Awareness of the carcinogenicity of areca nut among chewers has been minimally evaluated. The task of diagnosing and treating oral cancer at its early stages has proven to be a challenge worldwide.[15,16] Research in Saipan has shown that 43% of API adults chew areca nut, and cancers of the oral cavity contributed to 13% of cancer-related mortalities in the last decade.[17] As such, patient awareness of the causes, signs and symptoms of oral cancer is crucial to improving outcomes. The purpose of this survey study is to further evaluate these topics in Saipan, the capital of the CNMI.

Methods

Survey

This is a survey study that was undertaken at the Commonwealth Healthcare Corporation (CHC), the only regional hospital complex in the CNMI. From February to March 2019, a 21-question survey instrument regarding areca nut and oral cancer was distributed to 300 participants aged 18 years or older who chewed areca nut. Participants consisted of outpatients and their family members. Inpatients and former, but not active chewers, were excluded from participation. Participants were recruited via written advertisements placed throughout the outpatient waiting area. Current betel nut use, verification of no prior survey completion, and literacy was determined via verbal questioning. If a participant was unable to read the survey, the questions were read to them by one of the authors. Attached to the survey was an information sheet describing the purpose of the survey, assuring participants that their participation was voluntary and that their responses would be kept anonymous, not affecting their relationship with CHC staff or their quality of care. The survey collected exclusively de-identified data. In exchange for their time, participants were compensated with one United States dollar. This project was performed in conjunction with the University of Texas Southwestern and was approved by the Institutional Review Board (IRB# STU-2018-0221).

Statistical Analysis

Completed questionnaires were entered into a Microsoft Excel Version 16.24 (Microsoft, Seattle, WA) spreadsheet. Data were compiled, manipulated, and analyzed using Microsoft Excel. Statistical analysis was performed using Chi-squared tests, at a significance value of $P < .05$. Survey non-responses were noted and appropriately removed from calculations.

Results

The average age of the participants was 38 years, and 41.0% were male. A vast majority of participants identified as being of API heritage (92.3%) (Table 1). Roughly ninety percent reported chewing every day (87.5%) and 72.3% reported chewing 4 or more times per day (Table 2). The average, median, and range of age at first chew were 16.5 years, 15.5 years, and (4, 52 years), respectively. Over half (56.3%) added a plant leaf (*Piper betle*), 89.3% added lime, and 84.7% added tobacco to their chew. Of those that mixed tobacco into their chew, nearly two-thirds added tobacco 76%-100% of the time (62.3%, data not shown). Cigarette tobacco was the most popular type of added tobacco (75.0%). Those who added tobacco to their chew were more likely to also add lime compared to those who did not add tobacco ($P < .001$). The most common reason for chewing was "It keeps me awake" (45.7%). Nine of 10 participants knew that chewing areca nut causes oral cancer (92.3%) (Table 3). However, only thirteen percent of participants identified the actual areca nut as a carcinogen (13.0%). Roughly two-thirds correctly identified all three images of a small tongue tumor, large tongue tumor and a neck mass as potential cancers (71.6%) (Figure 1). Over

Table 1. Age, Ethnicity, and Sex of Areca Nut Chewer Participants in the CNMI, N=300

	n	%
Age (in years)[a]		
18-29	95	31.7
30-39	89	29.7
40-49	61	20.3
50-59	33	11.0
60+	22	7.3
Ethnicity[b]		
Chamorro	131	43.7
Carolinian	114	38.0
OPI[c]	60	20.0
FCA[d]	12	4.0
Other	22	7.3
Sex		
Male	123	41.0
Female	177	59.0

[a] Mean age was 38.0 years; [b] Participants were asked to "Choose all that apply";
[c] OPI: Other Pacific Islander; [d] FCA: Filipino, Chinese or other Asian

Table 2. Areca Nut Chewing Behaviors among Participants in the CNMI, N=300

	n	%
At what age did you start chewing? (MR=10)[a]		
< 10	36	12.4
10-19	192	66.2
20-29	38	13.1
30-39	14	4.8
40-49	7	2.4
50-59	3	1.0
How often do you chew? Choose one: (MR=3)[a]		
Every day	260	87.5
Every week	24	8.1
Every month	13	4.4
On days that you chew, how many chews per day do you usually have? Choose one: (MR=4)[a]		
1	17	5.7
2-3	65	22.0
4 or more	214	72.3
How often do you add tobacco to your chew? Choose one: (MR=1)[a]		
Never	26	8.7
1%-25% of the time	71	23.7
26%-50% of the time	15	5.0
51%-75% of the time	17	5.7
76%-100% of the time	170	56.9
When you chew betel nut, do you add any of the following? Circle all that apply:		
Plant leaf	169	56.3
Lime[b]	268	89.3
Tobacco[b]	254	84.7
Other	21	7.0
Why do you chew betel nut? Circle all that apply:		
It keeps me awake	137	45.7
It makes me feel good	112	37.3
I like the taste	86	28.7
It's a part of my culture	85	28.3
I like the act of chewing	43	14.3
What type of tobacco do you add to your chew? Choose one:		
Cigarette tobacco	225	75.0
Chewing tobacco	38	12.7
Other tobacco	10	3.3
Not applicable – I don't add tobacco	27	9.0

[a] Number of missing responses (MR) for each question are indicated
[b] Participants who added tobacco to their chew were also more likely to add lime, $P < .001$

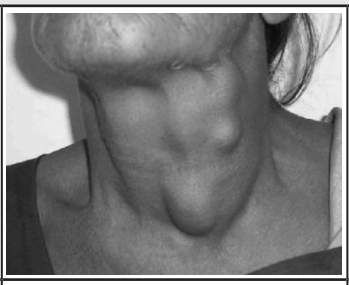
half believed that oral cancer could be treated (59.2%); a larger percentage believed that seeking medical care early would improve survival chances (85.2%). Nearly two-thirds personally knew someone who had or has mouth cancer (64.0%). A slight majority was interested in participating in programs to help them quit (63.0%). Approximately three-quarters were willing to try medicated products such as gums or candies to help them quit (79.5%), and a similar proportion was willing to participate in a screening program for oral cancer (74.0%). Those who chewed areca nut daily were more willing to try medicated products such as gums or candies than those who chewed less frequently ($P=.048$). No significant associations were found between knowledge of areca nut carcinogenicity and sex ($P=.727$), age ≤35 ($P=.328$), ethnicity ($P=.197$) or willingness to participate in cessation programs ($P=.325$) or screening programs ($P=.179$) (Table 4).

Table 3. Perceptions of Areca Nut Use and Oral Cancer Among Participants in the CNMI, N=300

	N	%
Do you think chewing betel nut causes deadly mouth cancer? (MR=2)[a]	275	92.3[b]
What part of the betel nut chew do you think causes cancer? Circle all that apply:		
The leaf	14	4.7
The tobacco	229	76.3
The actual betel nut	39	13.0
The lime	208	69.3
Do you think that mouth cancers can be treated? (MR=18)[a]	167	59.2[b]
For people with a mouth cancer, do you think it matters when they seek medical care? (MR=3)[a]	253	85.2[b]
Do you personally have a family member, close friend or community member who had or has mouth cancer? (MR=0)[a]	192	64.0[b]
Would you be interested in participating in a program to help you quit betel nut? (MR=11)[a]	182	63.0[b]
Would you be willing to try chewing medicated gum, using medicated candies or patches to help reduce your betel nut use? (MR=8)[a]	232	79.5[b]
Would you be willing to participate in a program where a medical provider examines your mouth to see if you have a mouth cancer or pre-cancer? (MR=11)[a]	214	74.0[b]

[a] Number of missing responses (MR) for each question are indicated
[b] This was a "Yes or No" question. Percentages were calculated by dividing number of "Yes" responses by number of valid responses.

Figure 1. Ability of CNMI Areca Nut Chewers to Identify a Small Tongue Lesion, Large Tongue Lesion, and Neck Mass as Potential Malignancies, N=300

"Do you think the following lesion could be cancer? Choose one:"[a]				
Yes	224 (78.0%)	269 (93.4%)	251 (86.9%)	199 (71.6%)[b]
No	33 (11.5%)	13 (4.5%)	34 (11.8%)	
Only if it bleeds, causes pain, or other symptoms	30 (10.5%)	6 (2.1%)	4 (1.4%)	
Missing responses	13	12	11	22

[a] Pictures indicate from left to right: small tongue lesion, large tongue lesion, and neck mass; [b] Number of participants that responded "Yes" to all 3 questions

Table 4. Chi-squared Likelihood of Knowing that the Actual Areca Nut Was a Carcinogen, N=300

Variable	*P*-value
Male sex	.73
Age ≤ 35	.33
API ethnicity	.197
Willingness to participate in quitting programs[a]	.32
Willingness to participate in screening programs[a]	.179

[a] N=289 for these associations, due to missing responses

Discussion

This survey supports prior studies from Micronesia demonstrating that areca nut is used by a diverse population of APIs, with high rates of tobacco and lime additives.[6,11-14] The majority of chewers do so habitually on a daily basis, and with 4 or more chews per day. These concerning trends are not characteristic of all areca nut regions and may be contributing to an increased oral cavity cancer burden in the Pacific islands.

Few studies have evaluated patient insights into the dangers of areca nut and the signs and symptoms of oral cancer. One study that qualitatively evaluated beliefs towards carcinogenicity in Micronesia showed that the link between areca nut and oral cancer was generally condemned among certain ethnic groups.[12] Another study that evaluated Bangladeshi adult patients in a London general practice showed that over 80% of both men and women were aware of the dangers of smoking tobacco, but only 24% of men and 36% of women were aware of the carcinogenicity of areca nut chewing.[18] This is congruent with the findings from our survey, which revealed considerable misperceptions regarding areca nut and oral cancer in the CNMI. Although a majority of chewers were aware that chewing causes oral cancer (92.3%), a staggering 87.0% did not know that the actual areca nut is a carcinogen. The concept that an organic plant product can cause cancer may be a source of significant confusion. A majority (76.3%) were aware that the tobacco part of a betel nut chew causes oral cancer but 69.3% believed that lime is a causative agent. The practice of adding lime to the chew is thought to be an enhancer of the areca nut effect via gamma-aminobutyric acid (GABA) uptake inhibition, but there is no data to suggest that lime is a carcinogen.[19,20] Although a majority were able to identify presenting signs of oral cancer, over half of the participants (59.2%) believed that oral cancers are treatable. Patients who do not believe oral cancer to be treatable may be more likely to delay seeking medical attention, or avoid it entirely. Fatalistic beliefs about cancer have historically been associated with ethnic minorities and lower socioeconomic status.[21] A study by Beeken found that cancer fatalism was also associated with a lower perceived value of early detection and fear of seeking medical consultation for possibly-cancerous symptoms.[22] Though nearly half of the participants did not believe that oral cancer could be treated, over four-fifths (85.2%) believed that seeking medical care early would improve survival chances, indicating that beliefs about cancer fatalism are not absolute, and most patients perceive some value from seeking medical care early.

Some of the survey results were very encouraging, and supported interest in cessation, treatment and screening programs. Eighty percent of respondents were amenable to trying replacement products and 74% were open to participating in oral screening programs. Regarding replacement products, nicotine gum is a promising consideration for multiple reasons. Many of the reasons for chewing areca nut in our study (stimulant effects, like the taste, act of chewing) would be addressed by nicotine gum.[13] Furthermore, with nearly 85% adding tobacco to the chew, a concurrent nicotine addiction may be present.[23]

Studies have shown the effectiveness of placing warning labels on cigarette packages for increasing health knowledge and smoking cessation, with pictorial warnings being especially useful for populations of lower educational levels.[24,25] Areca nut can currently be bought throughout the CNMI without any health warning labels. The results of this survey suggest that implementation of areca nut warning labels might help with chewing cessation via increased knowledge of carcinogenicity of areca nut. Such an intervention could directly educate an at-risk population of chewers about the dangers of areca nut and its relationship to oral cancers. Previous research in Asia and Micronesia has proven both the utility and cost-effectiveness of screening high-risk individuals for oral cancer.[11,26] With 74% of survey respondents reporting being interested in being screened, a commonwealth-wide effort in this regard should be seriously considered.

This study is limited by the use of exclusively self-reported, survey-based data and the associated risk of biases. Despite explicit assurance of patient confidentiality, the responses are at risk of a reporting bias. Similarly, as participants were recruited from in and around the hospital environment, our results might not be perfectly representative of the entire API population as a whole, as some might avoid the healthcare system. A power analysis was not performed to determine the number of surveys to administer. Instead, this value was based on prior survey studies regarding areca nut usage in Micronesia.[6] Verbal confirmation of active areca nut chewing status and verification of prior survey completion are inherently subject to imprecisions. Furthermore, as this was a new survey made to address highly relevant topics that have been minimally evaluated, there was no pilot study. As such, this survey has yet to be validated outside of the authors' personal experiences. Not all of the participants completed the survey in its entirety – this limitation is thought to have minimal impact on the data presented, as no individual question in the survey received less than 280 responses. Lastly, the study is fairly limited as surveys were distributed only on the island of Saipan. These findings can likely be generalized to other culturally similar islands of Micronesia but may not be reflective of patient perceptions in other areca nut regions such as those in Asia.

Conclusion

A majority (87%) of areca nut chewers in the CNMI have considerable misperceptions regarding the dangers of chewing and the nature of oral cancer. Educational warning labels should be distributed with areca nut sales to address these deficiencies and promote informed decisions. Nicotine replacement products, educational programs and commonwealth-wide oral screening efforts should be seriously considered.

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