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Research Article

## Betel Nut Consumption in Yap, Federated States of Micronesia: Early Age Introduction and Routine Practice

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### Abstract

Betel nut (BN), the fruit from the palm *Areca catechu*, is the fourth most commonly used psychoactive drug worldwide. BN's harmful effects include an increased risk of oral and upper aerodigestive cancers. Current BN consumption, preparation, age of use and health attitudes among the Yapese population, which has a strong cultural tie to BN was assessed. Surveys were conducted by trained Public Health staff during the Fall 2014, using a standardized instrument. Of 700 Yapese randomly interviewed, 88.5% are current users with the majority (87.9%) aware of harmful effects of BN. Yapese are introduced to BN at a mean age of 13.9 + 5.8 years (range 2 to 50 years) and begin routine daily use at 17.8 + 6.1 years (range 2 to 53 years), with no significant gender difference. Culturally sensitive educational efforts need to be directed towards the young to reduce adverse health risks associated with BN chewing.

**Keywords:** Areca Nut; Betel Nut; Carcinogen; Culture; Education; Federated States of Micronesia; Tradition; Yap

### Introduction

The fruit of the *Areca catechu* palm is commonly chewed in India, Southeast Asia and the western and south Pacific regions for its mild psychomactive effects such as feelings of euphoria, well-being and heightened alertness [1]. The areca nut can be chewed alone (Figure 1A and Figure 1B), although it is more commonly wrapped in the leaf of the *Piper betle* vine earning it the name of betel nut or betel quid, with additives such as slaked lime (calcium hydroxide), tobacco, and spices to enhance its absorption, psychoactive effects, and taste [2].

Chewing betel nut, particularly when used in combination with slaked lime and tobacco, is associated with an increased risk of oral sub-mucosal fibrosis, oral pre-cancerous lesions, oral squamous cell carcinoma and oral leukoplakia [3]. Betel nut is carcinogenic whether or not it is chewed alone or in combination with tobacco [3]. Betel nut use has also been associated with an increased risk of asthma, chronic kidney disease, hypertension, adverse reproductive events, and non-oral types of cancer such as esophageal, laryngeal, lung, pancreatic and cervical [4-7].

Betel nut chewing practice in the western Pacific region of Mi-

cronesia has been predominantly influenced by Yapese practices, in which slaked lime and tobacco are commonly added to the wrapped nut. Betel nut use by adolescents in the islands of Micronesia has been described previously [7], among middle and high school students, betel nut use may be greater than 60%, and many of these adolescents add tobacco to their betel nut [8-10].

Data on use by younger children is limited, but observational evidence in Yap suggests that use may begin as early as two years of age. Betel nut use at an early age may increase the risk of oral cancers and other adverse effects, and may increase the risk of dependence [10,11]. A fundamental objective of this survey was to identify the age when betel nut was first introduced to or attempted by the participant as well as the age when betel chewing became a standard practice.

## Materials and Methods

An oral survey was developed to assess betel nut use and contributing factors in the native population residing in Yap, Federated States of Micronesia (FSM). FSM is a small island nation in the western Pacific Ocean, Yap is one of four FSM states and the state includes 18 inhabitable islands as well as many small uninhabited atolls and islands.

Survey data was collected via a standardized oral data collection instrument. The survey was designed to determine the prevalence of betel nut use in the Yapese population, the age when betel nut was first used, age when betel nut was used on a regular daily basis, knowledge about harmful health effects, and attempts to discontinue use. The survey also included questions regarding preparation of betel nut for chewing, and participation in other addictive behaviors including alcohol usage and smoking cigarettes habits. The survey was administered by The Department of Health Services, Yap State Hospital Division of Public Health staff and dispensary health assistants on the outer islands after training sessions conducted by one of the principle investigators. A pamphlet was prepared that focused on the history of betel nut in Yap and the health risks associated with chewing was distributed to participants at the completion of the survey.

The target population was native born Yapese and Yap Outer Islanders (Figure 2A and Figure 2B). According to the 2010 census, there were a total of 11,376 inhabitants in Yap State, including 5635 males and 5741 females, with 3159 inhabitants residing in the Yap Outer Islands [12]. Men and women 16 years of age and older were included. Participants were identified in the market places, villages on Yap and the outer islands, hospital and outpatient clinics and other gathering places of the local population. The survey was conducted between October 1 and December 31, 2014. Participants were asked if they were willing to answer survey questions about betel nut before beginning the survey questions. Consent was implied

when the participant agreed to answer the questions. No individual refused to participate. Many asked additional questions after the survey about the effects on health from betel nut usage. There is no Institutional Review Board at the Department of Health Services, Yap.

Statistical analysis was performed using SPSS Inc v23.0 (Chicago, Il.) and included frequency, chi-square, correlation, and logistic regression analysis. Variables tested included preparation of betel nut, frequency of usage, current age, age at first use of betel nut, age of routine use of betel nut, knowledge of harmful effects, willingness to discontinue usage in weeks, current residence, gender, education level completed, smoking tobacco usage, and alcohol consumption. The mean value is expressed with the standard deviation (sd). A p-value < 0.05 was considered statistically significant.

## Results

### Participant characteristics

The betel nut health survey was administered to 700 Yapese men and women. The mean age of the participants was 33.2 years (range 16 – 90, sd + 13.1). There was no statistical difference between mean age of men and women participants. Participant characteristics are included in Table 1.

Characteristic	Result
<b>Gender (n)</b>	<b>(%)</b>
<b>Male (319)</b>	45.6%
<b>Female (381)</b>	54.4%
<b>Total (700)</b>	
<b>Education Completed</b>	<b>(%)</b>
<b>None</b>	1.0
<b>Primary</b>	2.3
<b>Middle</b>	13.4
<b>Secondary</b>	50.6
<b>College (2 years)</b>	27.6

<b>Professional</b>	5.1
<b>Participant's age</b>	<b>Mean <math>\pm</math> sd, range</b>
<b>Men</b>	33.5 $\pm$ 12.7 years (16-90)
<b>Women</b>	33.0 $\pm$ 13.4 years (16-90)
<b>Local Residence</b>	<b>(%)</b>
<b>Yap proper [Add number]</b>	72.0
<b>Outer islands [Add number]</b>	28.0
<b>Betel nut chewers</b>	<b>(%)</b>
<b>Men</b>	90.3
<b>Women</b>	87.1

**Table 1.** Participant Characteristics.[Add a break down by Age: 0-1, 2-3, 4-5.....]

**Betel nut usage**

Most Yapese (95.4%) have tried betel nut at least once and 88.5% are current chewers, with no statistical difference between genders. The most frequent reason given for not chewing included dislike (32.9%), health concerns (30.1%), spouse/family disapproves (9.6%) and discoloration of teeth (8.2%).

The majority of participants were aware that there were harmful health effects associated with chewing betel nut (87.9%). Educational information was most frequently obtained from health care providers, such as doctors, nurses and public health staff (41.9%), family members (13.6%) and school (11.7%).

The most common betel nut preparation included the use of a pepper leaf (78.3%) and the combination of betel nut, tobacco

and lime (56.9%). The various combinations for betel preparation are described in Table 2. A similar trend is noted for both men and women. On a typical day, 43.0% of those surveyed chew more than 20 times per day while only 3.2% chew once daily.

Preparation	Frequency (%)		
	Total	Men	Women
Betel nut alone	2.2	2.8	1.8
Betel nut with lime	6.1	5.2	6.8
Betel nut with tobacco, no lime	5.3	4.5	6.0
Betel nut with tobacco and lime	56.9	60.3	53.9
Betel nut with tobacco, lime and alcohol	29.6	27.2	31.5

**Table 2.** Most common preparations of betel nut by Yapese surveyed comparing men and women.

Betel nut usage begins at a relatively young age. The overall mean age to first try betel nut was 13.9 + 5.8 years (range 2 to 50 years) and the overall mean age when betel nut chewing was routine was 17.8 + 6.1 years (range 2 to 53 years), when most are high school students. There was no significant difference between women and men for age of routine betel nut usage (17.9 + 5.9 years [range 8 to 48 years] versus 17.6 + 6.7 years [range 2 to 53 years]), respectively.

Residence (Yap proper or Outer Islands) did not significantly influence the mean age of first trying betel, or the age of routine use. Table 3 depicts the mean ages for first use and routine use and participants based upon reported residence.

Variable	Designated Residence			
	Yap Proper [Add total]		Yap Outer Islands [Add total]	
	Mean Age	Range	Mean Age	Range
Overall mean age	33.2 $\pm$ 14.0	13 - 90	34.2 $\pm$ 13.6	13 - 70
Mean age when betel nut was first introduced	13.8 $\pm$ 5.9	2 - 50	13.9 $\pm$ 5.9	2 - 40
Mean age for start of routine use of betel nut	17.8 $\pm$ 6.4	2 - 53	17.7 $\pm$ 4.8	8 - 40

**Table 3.** Comparison of residence and mean age in years for first and routine betel nut usage.

## Social behavior

Of those 629 participants who currently chew betel nut, 63.3% had attempted at one time or another to stop chewing. The most common reasons for trying to break the betel nut chewing habit included health concerns (44.6%), Lent abstinence (15.1%), expense (5.4%), discoloration of teeth (5.2%), and general dislike of the taste (5.0%). The mean duration of abstinence was 28.0 + 78 weeks (range 0.1 to 572). The most common reasons for restarting the betel nut habit included peer pressure (36.4%), craving, withdrawal symptoms (27.4%), conclusion of Lenten season (7.8%) and simply enjoying chewing (7.5%). At the end of the survey, 81.3% of participants who currently chew betel nut agreed they would stop chewing if they knew betel nut would harm their health. Of those who chew, 88.5% reported to be aware of health risks with the practice. Most participants are aware of health risks, most indicate they would stop chewing, but only about two-thirds actually attempted unsuccessfully to discontinue the practice. Alcohol consumption and tobacco cigarette smoking was assessed. Overall, alcohol is reported to be consumed by 50.7% of the participants and does not include the alcohol used in the betel nut preparation. Tobacco smoking was reported in only 24.7% of the participants.

## Univariate analysis

There was no significant correlation with current age and awareness of health risks, current use of betel nut, daily frequency of betel nut usage, preparation, and attempts to quit. Male gender was associated with alcohol consumption (Odds ratio [OR] 2.57 [95% CI 1.89 – 3.50],  $p < 0.001$ ), and smoking cigarettes (OR 3.14 [95% CI 2.19 – 4.50],  $p < 0.001$ ), and chewing betel nut more than 20 times per day (OR 1.09 [95% CI 1.01 – 1.18],  $p = 0.034$ ) compared with female gender. Current residence on the Outer Islands was associated with a greater likelihood to report tobacco use (OR 1.67 [95% CI 1.14 – 2.43],  $p = 0.008$ ) and alcohol consumption (OR 1.67 [95% CI 1.19 – 2.33],  $p = 0.003$ ) and were less likely to be aware that betel nut posed harmful health risks (OR 0.43 [95% CI 0.76 – 0.24],  $p = 0.004$ ) compared to current residence Yap proper.

## Multivariate analysis

In a multivariate analysis, only male gender was associated with statistically significant alcohol consumption (OR 2.18 [95% CI 1.59 – 2.99],  $p < 0.001$ ) and smoking tobacco cigarettes (OR 2.61 [95% CI 1.80 – 3.79],  $p < 0.001$ ) compared with women. There was no gender difference for use of betel nut, knowledge, age, education level completed, current residence, age of first use, age of routine use of betel nut, preparation or frequency of usage.

In a multivariate analysis assessing the impact of current residence, those who reside in the Outer Islands were more

likely to report tobacco usage (OR 1.68 [95% CI 1.09 – 2.60],  $p = 0.018$ ) and alcohol consumption (OR 2.06 [95% CI 1.37 – 3.09],  $p = 0.001$ ) and less likely to be aware of the harmful effects of betel nut usage (OR 2.89 [95% CI 1.60 – 5.21],  $p < 0.001$ ) compared to those who reside on Yap proper. All other variables tested were not statistically significant.

## Discussion

Betel nut use in Yap is very prevalent, as previously reported [6] and further demonstrated by almost 90% of our study population reporting current use. Although several studies have demonstrated betel nut use in children of school going age 6,7,12-16, this present study provides strong evidence that children in Yap might start using betel nut as young as age two if not earlier. This observation presents a serious problem in terms of both health-risk behaviors later on in life and the increased risk of developing numerous adverse health outcomes associated with betel nut use including cancer.

Yap is known to have a long culture of betel nut use and in addition [6], betel nut is grown on the Island which presents an extra challenge in formulating interventions to prevent or minimize its use. There is an increased likelihood that initiating betel nut use at a younger age will translate into dependency throughout adult life. Scientific associations between adverse health risks and betel nut use have extensively been demonstrated. Also, The International Agency for Research on Cancer recently asserted that the betel nut is carcinogenic to humans [3]. Since it might take several decades for mutagenic action to be observed, the risk of developing cancers is significantly increased in individuals who use betel nut at a younger age.

There are several reasons why betel nut use initiated at a young age is troubling. First, there are significant adverse health risks associated with betel nut use in general and at a young age, children do not yet have the mental capacity to make an informed decision regarding a lifestyle that might result in significant morbidity or mortality later on in life. In this study, about 27% of respondents who reported not using betel nut indicated adverse health reasons for their decisions — a decision a young child will be unable to make. Next, this behavior is most likely to result in dependency on betel nut through adolescence and adulthood in the absence of any mitigating factors. Betel nut is frequently used with tobacco and alcohol— a finding replicated in this study. Also, there is evidence that suggests that betel nut use is comparable to nicotine use in terms of its addictive effect [14]. It is thus not incomprehensible that betel nut use could result in other addictive behaviors or substance abuse later in life.

A number of reasons have been associated with betel nut use at a young age including societal pressures, and educational level of parents or close relatives [15]. This study did not explore reasons for betel nut use at a young age as an objective, how-

ever based on our findings inferences can be made regarding possible reasons for betel nut use at an early age. Both males and females in this study reported that they initiated betel nut use at age two, although routine use on a daily basis was initiated at ages two and eight for males and females respectively. Based upon societal observations of the investigators, betel nut is offered to children under two years of age.

Our findings indicate that the educational level of our study population does not play a role in current betel nut use as greater than half of betel nut users reported completing at least high school. In addition, a majority (87%) of respondents who reported current betel nut use indicated that there were aware of the harmful side effects of its use. While a study reported that children of fathers with less than three years of education were three times more likely to use betel nut [16], our current observations indicate that educational achievement and knowledge of the adverse effects of using betel nut by parents or caregivers might not be associated with betel nut use in children in Yap. However, we suggest that this observation be interpreted with caution. The findings in this study are however in agreement with findings from a study in Palau — an island geographically part of the larger island group of Micronesia that betel nut use is deeply woven into the cultural and societal fabric hence the lack of a negating influence by factors such as level of educational achievement or knowledge of adverse effects of betel nut use [8-10].

Although, interventions targeted at preventing or reducing betel nut use should address all age groups in Yap, young children should be prioritized above other age groups for reasons presented above. The cultural and societal acceptance of betel nut use in Yap, as evidenced by our data, needs to be taken into consideration in formulating effective prevention strategies. A campaign that for instance focuses solely on a prevention message regarding the adverse health effects of betel nut use but does not address cultural reasons for usage is likely to be unsuccessful. Since Yap is known to export betel nut to other Pacific islands, and it is one of two major export crops [17], this implies that there is an economic benefit in its cultivation. An effective intervention should involve a focus on providing alternative sources of income to individuals who earn their livelihood from betel nut sales. For instance, a crop that is shown to thrive in Yap that provides similar revenue if not more might be a suitable alternative. Most importantly, any effective betel nut use prevention campaign should be comprehensive by involving all stakeholders including the community, schools, places of worship, elected officials, local chiefs or elders, and health care centers. Without the buy-in of all stakeholders, it might be difficult to make any significant headway.

In conclusion, betel nut use is very prevalent in Yap in part due to its strong cultural and societal acceptance. Although this study indicated that betel nut use might start at two years of age, our observations including anecdotal evidence in the

current study population indicate that children younger than two years of age are being given betel nut, however additional research into this observation is warranted. We recommend a comprehensive intervention that involves all stakeholders, including parents and children, with preventing betel nut use in young children as the priority.



Figure 1.

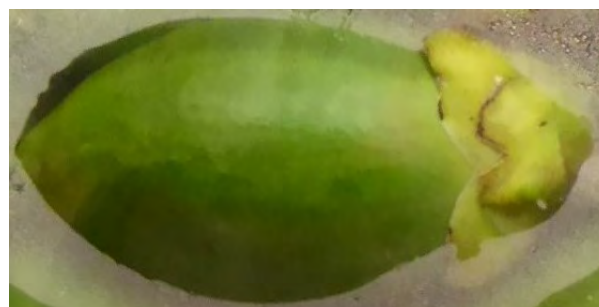


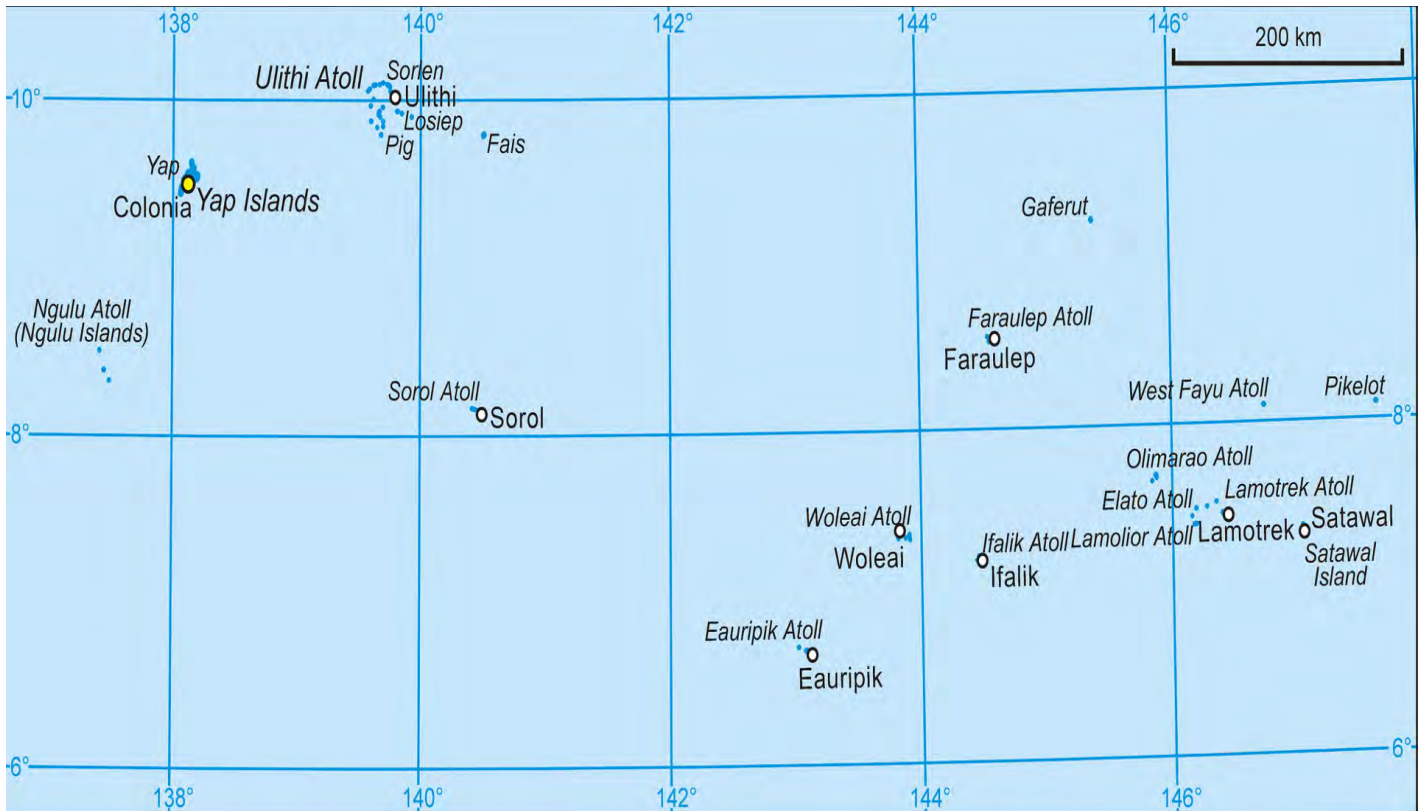
Figure 2.



Figure 3.



Figure 4.



**Figure 5.**

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