



# Betel Quid Use and Oral Cancer in a High-Risk Refugee Community in the USA: The Effectiveness of an Awareness Initiative

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## Abstract

Betel nut (BN) is a psychoactive oral carcinogen that is commonly used among Asian communities. This study aims to investigate BN usage patterns and the effectiveness of a visually guided educational initiative in a high-risk refugee population. All adult patients presenting to a private practice clinic, free community clinic, or health fair in the refugee community of Clarkston, Georgia during days when survey staff were present were approached for the study. Participants were first categorized into a familiar and unfamiliar cohort depending on participant-reported familiarity with BN. Depending on familiarity, subjects were then administered a pre-intervention test surveying health awareness for BN and usage patterns where relevant; subsequently, a visually guided educational brochure was reviewed, and a post-intervention test was administered. Results were statistically analyzed (STATA 12). Forty-eight participants were surveyed for the familiar cohort and 25 for the unfamiliar cohort. Among the familiar cohort, South and Southeast Asians comprised 91% of participants. On frequency of use, 42.8% reported social, 28.6% reported usage during celebrations only, and 28.6% reported daily. The most common reasons for use were for taste (40.9%), enjoyment (38.6%), and addiction (25%). Among the familiar cohort, 75% believed BN was harmful for health compared to 8% among the unfamiliar ( $p < 0.0001$ ). In the familiar cohort, 52.3% believed BN alone could cause cancer compared to 4% among the unfamiliar ( $p < 0.0001$ ). Following the educational intervention, 100% of participants believed BN mastication is harmful in both cohorts ( $p < 0.01$ ), while 87.5% of participants in both cohorts recognized that BN alone could cause cancer ( $p < 0.0007$ ). This study illustrates gaps in understanding regarding oral cancer and the health consequences of chronic BN mastication, as well as the efficacy of a visually guided educational brochure to improve participant knowledge among a high-risk refugee population

**Keywords** Health disparities · Early detection · Oropharyngeal cancer risk factors

## Introduction

Recreational use of betel nut (BN) is common worldwide, and an estimated 10–20% of the world population has chewed BN in their lifetimes. A 2012 review by the World Health Organization (WHO) found that BN is the fourth most commonly used psychoactive substance globally. Its usage is most common in areas of Southeastern Asia, including Myanmar, India, Pakistan, and island nations of the South Pacific [1]. BN is typically chewed in a prepared form known as betel quid,

where the nut is mixed with spices and other ingredients. Through substances released upon mastication, BN produces feelings of euphoria, alertness, and increased stamina [2]. BN usage also plays an important role in tradition within these Asian cultures [1]. The process of preparing the quid form can represent a form of socialization for young women, and BN usage is often associated with ceremonies, such as weddings and funerals [3, 4]. Consequently, BN mastication represents an integral part of life in many of these cultures.

However, chronic and regular BN use raises the risk of many health problems, including oral leukoplakia, oral submucosal fibrosis, periodontal disease, and dental staining [5]. Perhaps the most concerning of these is the increased risk of oral squamous cell carcinoma (SCCa); indeed, the incidence of oral cancer in individuals who regularly chew BN can be nearly three times that of non-chewing individuals [2, 6]. In 2004, the WHO's International Agency for Research on Cancer (IARC) issued a monograph declaring that BN was

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carcinogenic in humans, since more than 50% of oral SCCa globally occurred in areas of Southeast Asia where usage was most prevalent [7]. In addition, while BN alone can be carcinogenic, the prepared quid form often includes tobacco as a secondary ingredient, and quid is often sold next to tobacco products to promote their concurrent use [2]. Together, these risk factors illustrate that the spreading prevalence of BN usage can pose a major public health concern around the world.

While the prevalence of BN use and its link to oral SCCa is becoming more established in the medical community, these risks may not be well appreciated by the general public. For example, in an urban squatter settlement in Pakistan, 40% of participants chewed some form of BN daily but only 21% had satisfactory knowledge of the substance's carcinogenic properties [8].

In this study, the authors aim to describe the usage patterns and health awareness of BN users in Clarkston, Georgia, a refugee resettlement area outside metropolitan Atlanta in the USA. Many of these community members emigrated from countries in South Asia where prevalence of BN usage is high. In a refugee population already faced with many healthcare comorbidities, such as high rates of mood disorders, cardiovascular disease, and obesity, chronic BN use adds yet another layer to their complex health profile [9]. The purpose of this investigation is threefold: to better describe BN usage patterns in this high-risk refugee community, to identify the level of participant awareness regarding the associated health risks, and to design, implement, and evaluate the efficacy of a visually guided educational intervention aimed to improve community awareness. In light of the public health consequences related to BN use, the authors believe such initiatives are imperative in promoting early detection of head and neck cancers.

## Methods

### Participant Recruitment

The study protocol was submitted to the Institutional Review Board (IRB), and our study was determined to be IRB-exempt since it was categorized as a community needs assessment. Patient recruitment took place at the Clarkston Community Health Center (CCHC), a community free clinic; the Greater Atlanta Family Healthcare Clinic (GAFH), a private practice clinic; and health fairs in Clarkston, Georgia from June through October 2016. All patients seen at these locations while study staff were present were approached for the study and verbal consent was requested prior to continuing. Participants were then queried on their familiarity with BN; those who reported familiarity were separated into the “familiar cohort,” while those who denied familiarity were placed in the “unfamiliar cohort.” Our goal for investigating both BN users and non-users was to

establish a baseline for the evaluating the effectiveness of our newly created educational brochure among both groups.

### Survey Design

Two surveys were designed for this study, one for the unfamiliar cohort and one for the familiar cohort. For both cohorts, surveys included illustrations to target this low-English proficiency and low-literacy population. The surveys for the familiar cohort included questions on BN usage patterns, including frequency of and reason for use, and addiction. The surveys for the unfamiliar cohort included introductory questions on BN, such as identifying its appearance and method of use. Surveys for both groups contained questions regarding beliefs on BN health risks, beliefs on BN carcinogenesis, and signs of head and neck cancer, which are directly related to the implemented educational brochure.

### Survey and Educational Brochure Administration

Participants who provided verbal consent to participate were administered pre-intervention surveys designed for each respective group, familiar or unfamiliar. Subsequently, an educational brochure illustrating the health risks associated with chronic BN mastication and information on oropharyngeal cancer was reviewed. Following the educational initiative, the same survey was administered again to evaluate post-intervention knowledge. Results were analyzed using univariate regression and chi-squared analysis (STATA 12, College Station, TX).

## Results

### Study Demographics

Of the 133 patients who were approached for this study, 59 patients reported familiarity with BN usage while 74 patients denied familiarity with BN usage (Table 1). Seventy-three patients provided verbal consent to continue onwards with the investigation. Within this cohort of participants, 48 individuals reported familiarity with BN while 25 denied familiarity. The most common reason to decline the survey was lack of familiarity with BN (81.7%). Among the familiar cohort, South and Southeast Asians comprised 91% (Fig. 1a). Of these participants, 59% self-identified as male, the average age was 39 years old, and the average number of years spent in the USA was 10.6 years. Among the unfamiliar cohort, the largest ethnic group (56%) self-identified as American-born (i.e., African American, Caucasian) (Fig. 1b). Of those participants, 32% self-identified as male. The average age was 35.9 years old, and the average number of years spent in the USA was 25 years.

**Table 1** Table illustrating demographics of study subjects

Characteristic	Total ( <i>n</i> = 73)	Familiar cohort ( <i>n</i> = 48)	Unfamiliar cohort ( <i>n</i> = 25)
Age, mean years (SD)	37.67 (13.4)	39 (13.5)	35.92 (13.5)
Sex (%)			
Male	37 (50.7)	29 (60)	8 (32)
Female	36 (49.3)	19 (40)	17 (68)
Ethnicity (%)			
Southeast Asian	35 (47.9)	32 (67)	3 (12)
South Asian	9 (12.3)	9 (19)	0 (0)
Middle Eastern	5 (6.8)	1 (2)	4 (16)
East African	4 (5.4)	2 (4)	2 (8)
American (Caucasian, African American)	14 (19.2)	0 (0)	14 (56)
Other	6 (8.2)	4 (9)	2 (8)
Site (%)			
Private clinic	25 (34.2)	6 (13)	19 (76)
Community free clinic	45 (61.6)	39 (81)	6 (24)
Health fair	3 (4.1)	3 (6)	0 (0)
In USA, mean years (SD)	15.5 (15)	10.1 (8.16)	25.37 (19.4)

**Betel Nut Usage Patterns in the Familiar Cohort**

Within the familiar cohort, 64.6% reported the study participant themselves used BN and 68.1% reported that a relative or community member used BN. Subjects reported a shorter average length of continuous, regular usage when describing their own usage habits (3.34 years) compared to that of their acquaintances, relatives, or community members (15.24 years, *p* = 0.0041). The most commonly used ingredients in preparing the BN were betel leaf (37.8%), slaked lime (32.4%), sweetener (43.2%), and coconut (24.3%). Of note, 32.4% reported including tobacco and 10.6% were not aware of the ingredients used.

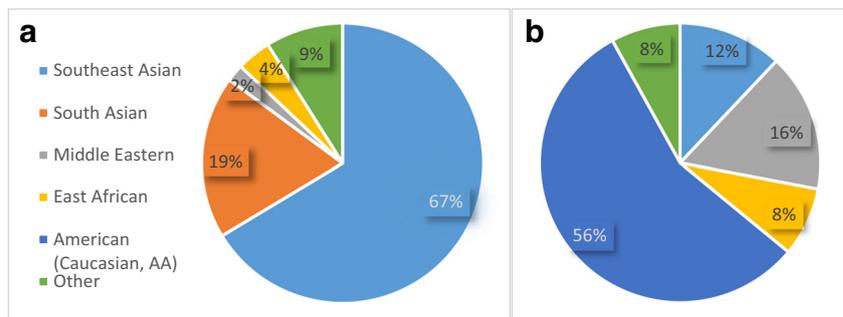
The frequency of participants’ BN usage distributed into the following groups: 48.2% reported social use (i.e., after meals or relaxing at home with family), 28.6% reported usage during celebrations only, and 28.6% reported daily use. The most commonly cited reasons for use were for taste/as a mouth freshener after meals (40.9%), for enjoyment

(38.6%), because of craving or addiction (25%), and because of culture/tradition (18.2%). Less than half or 40.9% reported that they wished they could quit, and 18.2% believed it would be difficult for them to go 1 week without using BN. Only 13.6% had ever received information on health risks and methods for quitting.

**Betel Nut Health Awareness and Intervention Effectiveness**

At baseline, 75% of the familiar cohort believed BN was “harmful for health” compared to 8% among the unfamiliar cohort (*p* < 0.0001). Among both cohorts, the most common reasons cited were teeth discoloration (29.26%), cancer (29.26%), tobacco contents (14.6%), and addiction (14.6%). However, answers ran the gamut from “kidney stones” to “thins the blood.” In the familiar cohort, 52.3% of participants believed BN alone could cause cancer compared to 4% among the unfamiliar cohort (*p* < 0.0001); in contrast, 90 and 100%

**Fig. 1** Pie chart illustrating ethnic breakdown of study subjects in **a** familiar cohort and **b** unfamiliar cohort



of subjects believed smoking tobacco could cause cancer, respectively. With regard to participants' abilities to recognize oropharyngeal cancer, 68.8% identified cheek pain to be a sign of cancer in the familiar cohort compared to 8% in the unfamiliar cohort ( $p < 0.001$ ). In the familiar cohort, 70% of participants were able to recognize an image of tongue cancer compared to 54% of the unfamiliar cohort ( $p = 0.0002$ ). Both cohorts had difficulty identifying ear pain as a sign of cancer (familiar cohort, 18.8%; unfamiliar cohort, 8%).

Following the educational intervention, participants' knowledge that BN mastication is "harmful to health" improved significantly for both cohorts (familiar cohort, 100%,  $p = 0.011$ ; unfamiliar cohort, 100%,  $p < 0.0001$ ) (Fig. 2). Post-intervention participants in the familiar cohort were more likely to recognize that BN alone could cause cancer (87.5%,  $p = 0.0005$ ) and more capable of identifying oral cancer in an image ( $p = 0.011$ ). They were also more likely to identify cheek pain (95.8%,  $p = 0.005$ ) and ear pain (66.7%,  $p = 0.0004$ ) as signs of oropharyngeal cancer (Fig. 3). Post-intervention participants in the unfamiliar cohort also improved their ability to recognize oral cancer ( $p = 0.0002$ ), as well as cancer symptoms like cheek and ear pain ( $p < 0.0001$ ). Similarly, post-intervention subjects in the unfamiliar cohort were also more likely to recognize that BN alone could cause cancer (87.5%,  $p < 0.0001$ ). They were also more adept at identifying signs of oropharyngeal cancer, specifically cheek pain (92%,  $p < 0.0001$ ) and ear pain (and more likely to recognize an image of tongue cancer (100%,  $p = 0.0002$ ).

## Discussion

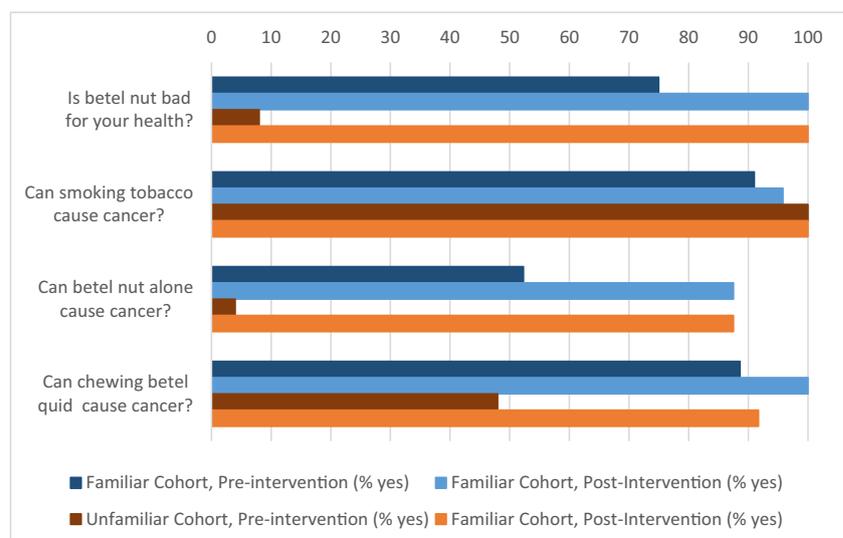
This study illustrates that long-term, chronic BN usage is prevalent in a high-risk refugee community in the USA, many of whose members emigrated from cultures where BN

mastication is commonplace. However, significant knowledge gaps exist regarding the health consequences associated with BN mastication. In general, participants reporting familiarity with BN were more mindful that chronic BN mastication is harmful to health compared to those who denied familiarity. Nonetheless, the sample's overall understanding of BN's carcinogenic properties remains low compared to other recreational substances such as tobacco. Furthermore, participants in both cohorts, but most notably the unfamiliar cohort, had difficulty recognizing images and signs of oral cancer. These findings reveal a more systemic lack of awareness regarding oral cancer among the sample surveyed, which may contribute to delays in presentation that have been well documented in the literature [10, 11]. Taken together, these findings show that with evolving migration patterns, public health education programs in the USA must take into account a more diverse array of public health concerns.

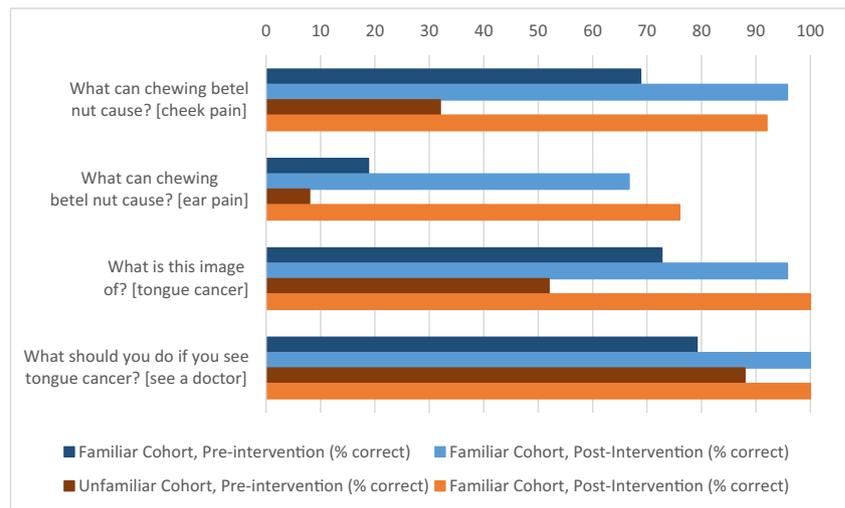
The results of this study add to a small volume of literature describing the increasing prevalence of BN usage within refugee and immigrant communities in Western nations. Though scant, these reports span a large geographical area, and descriptions of BN usage have been documented from around the world [12, 13]. However, to our knowledge, there has been no large-scale investigation into BN usage patterns in the USA [14], despite the fact that Asian Americans remain one of the country's fastest growing minority groups [15]. Therefore, while small-scale reviews and reports remain crucial in characterizing the pattern of BN usage in the USA, it is clear that the healthcare community must take more initiative in investigating and addressing the recreational use of BN as a potential national public health concern.

These results also corroborate existing reports that highlight the lack of awareness and concern regarding BN's health consequences among users and the healthcare community in

**Fig. 2** Knowledge on BN health risks for familiar and unfamiliar cohorts, pre- and post-educational intervention



**Fig. 3** Baseline knowledge on signs and symptoms of oropharyngeal cancer for familiar and unfamiliar cohorts, pre- and post-educational intervention



the USA. Within a group of Cambodian refugee women in California, a survey study found that while the association between smoking tobacco and lung cancer was accepted, none of the participants were aware of a correlation between BN and oral lesions [3]. Alarming, among a group of Burmese refugees in Australia, BN mastication was viewed as a benign alternative to tobacco use [4]. This lack of public knowledge is multifactorial. One source is the relative lack of physician knowledge to counsel on BN risks and behavior. A cross-sectional survey of dentists in North London, UK, found that a majority of practitioners did not have enough training to adequately foster awareness of the risks of BN use in their communities [16]. Consequently, there has also been a paucity of programs in place to promote BN cessation [2]. Moreover, the market for BN sale in the USA remains largely unregulated. In one study of 18 Asian grocery stores, BN products on sale were found to largely lack appropriate ingredient, nutrition, and warning information [17]. Anecdotally, the data gathered from this current study revealed BN to be readily accessible in many grocery stores in Clarkston, Georgia. It is unclear how this availability to a psychoactive substance may impact BN-naïve communities who reside within proximity to neighborhoods where usage prevalence is high. Taken together, these findings illustrate the growing importance of establishing educational initiatives for practitioners and patients alike regarding the health risks associated with BN mastication. Based on the success of tobacco-cessation campaigns, the impact that physician counseling and public health initiatives have on public behavior cannot be overstated, and the success of these programs can undoubtedly be replicated for BN users.

In the familiar cohort, our study had 48 willing participants out of a total of 59 patients approached (81.4%), demonstrating that a significant portion of the surveyed sample is at least interested in contributing to a better understanding of BN and its usage. Indeed, a survey of adults in Micronesia also found

that, though individuals believed it would be extremely difficult to quit their habits, they did feel vulnerable towards the malignant effects of tobacco and betel quid and were welcoming of an intervention [18]. In this investigation, a visually guided educational brochure targeted towards a low-English proficiency and low-literacy refugee population was piloted. These findings showed that knowledge on BN health risks as well as the signs and symptoms of oral squamous cell carcinoma (SCCa) among a cohort of patients in the Clarkston community could be successfully improved. We believe the success of this pilot initiative can help inform future endeavors to improving awareness, promoting cessation, and encouraging early detection of oral cancer within these high-risk refugee communities.

The strengths of this study include the utilization of an innovative, visually guided educational brochure and access to a unique cohort in a diverse resettlement community. This study is limited by the small sample size and a lack of generalizability to non-refugee, immigrant communities. In addition, the short time frame of the study may limit the perception of the long-term impact of this educational initiative. As such, future directions would include adding to the cohort, completing more pre/post-education surveys for the targeted population, and expanding knowledge of BN health risks and oral cancer for communities outside Clarkston, Georgia.

## Conclusions

This study illustrates that the prevalence of recreational BN use in a sampled patient population within a refugee community in the USA is high. Gaps remain in these users' knowledge regarding the carcinogenic properties of BN mastication, as well as among the entire community's awareness of oral cancer symptoms. This study also demonstrates the efficacy of a pilot educational initiative aimed to alleviate these

knowledge gaps. Given the relatively low significance afforded BN as a public health issue, the authors believe these efforts can help to spread awareness of the risks and spreading prevalence of recreational BN use in the USA.

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#### Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interests.

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