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Chewing Doma (Fermented Betel Nut): Culture versus Cancer?

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Abstract

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Areca nut consumption is embedded in many cultures, including that of Bhutan, several parts of India, and other South Eastern countries. Traditional fermenting of areca nut results in the production of what is called doma in Bhutan. The process enhances its carcinogenic potential and is tightly linked to oral and upper gastrointestinal cancers. As many as 45% of Bhutanese people chew doma. It is the number one cause of cancers of the oral cavity, oropharynx, hypopharynx, and larynx. We propose the slogan "Don't chew your way to cancer, say no to doma" would help in reducing oral and esophageal cancers in Bhutan.

Keywords

- carcinogenic
- lifestyle
- India
- Bhutan
- chewing
- areca

Introduction

The areca nut is the fruit of areca palm (*Areca catechu*). It grows in abundance in several parts of South Asia and Southeast Asia. More than 50% of the global areca nut production is from India (7, 23,000/ 13, 37,115 tons in 2017).[1] It is commonly called betel nut. This is different from betel leaves (*Piper betle*) that are usually consumed together (betel nut chewing), and being used rampantly across Bhutan, India, Nepal, and many other parts of the world. The betel nuts are consumed as a quid—a mixture of the betel nut, betel leaf, slaked lime with/without several other flavorings (e.g., cardamom).[2] Numerous studies have linked chewing betel nuts with cancers (especially those of the oral cavity, esophagus, and stomach). The people

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consuming betel nut also tend to have the habit of consuming alcohol and smoking tobacco. Epidemiological studies indicate that taking areca nut is also associated with other noncommunicable lifestyle diseases like hypertension and diabetes mellitus.[3] Following nicotine, alcohol, and caffeine, areca nut is the most common psychoactive drug across the globe, whose ingredients, arecoline, can readily cross the blood–brain barrier.[4]

In the year 1992, the International Agency for Research on Cancer (IARC) declared that chewing areca nut and cigarette smoking in combination is a human carcinogen. In the year 2004, IARC finally declared areca nut as a human carcinogen by itself.[5] Alkaloid content of betel nut is shown to be between 0.3 and 0.7%. These alkaloids include arecaidine, arecolidine, arecoline, arecatannin A1, arecatannin A2, guvacoline, guvacine, isoguvacine, homoarecoline, nicotine, and dichroine. In addition, the betel leaf contains 15 mg/g safrole, a known rodent carcinogen. After betel quid chewing, safrole can form stable safrole-DNA adducts in the oral tissue, which compounds the carcinogenic potential.[6]

Fermented betel nut is chewed in Bhutan and north eastern states of India, under different various names.[7] The raw materials used to ferment the areca nut include leaflet of areca nut, jute bag, and cow dung! It can be done in at least two popular ways. In method one, a pit of 2.5 feet is dug first. The leaflets of areca nut are placed on the bottom and the sides of the pit. Cow dung is then pasted on the leaves and covered with jute bags. The "wrapped' areca nuts are then covered with soil and allowed to ferment for 3 to 4 months. Following this recipe accurately can allow the product to be utilized for up to 2 years. In method two, the raw areca nuts are directly placed in jute bag, its mouth sealed airtight, and then the bag is soaked in water. This is a shorter process and the produce also has a shorter (3–4 months) shelf life. Unfortunately, either process leads to significant increase in the concentration of the carcinogen, arecoline.[8] One variant of these methods results in the fungus-infected moist chew of areca nut, where the ripe nuts are preserved directly in various layers of mud, called as Bura Tamul.[9] The fermenting methods are very similar in Assam. However, in Assam it is tradition to grow areca trees in the compound of house as a boundary and its nuts are consumed in various forms, including dried ones, fermented, sundried, and roasted.[10]

Fermented betel nut is called as "doma" in Bhutan.[11] Doma is an integral part of Bhutanese tradition and culture (just like it is in Assam, India, here the combination of betel leaf and nut is known as *gua*).[12] According to folklore, the original inhabitants of Bhutan (known as Monyul, the land of Monpas) ate raw meat and chewed bones.[13] In the eighth century, Guru Rinpoche created a substitute that is betel leaf, lime, and areca nut. Subsequently chewing doma became ingrained into traditional custom, which is served after meals, during rituals, and ceremonies. Traditional offering of doma is revered during the Zhugdrel Phuensum Tshogpa ceremony. Its offering as the final item (after food and fruits) is considered auspicious and facilitates prosperity. It can be said to be an essential part of Bhutanese life and culture.[14]

In India and particularly in Assam, areca nut is considered as "Fruit of Divine Origin," as well as associated with people to increase digestive properties and as breath freshener, the reason which many people initiate the chewing habit in childhood and adolescence.[15] The tradition is very deep rooted, such that the name of the capital city of Assam, Guwahati has originated from the Sanskrit word "Guvaka" meaning areca nut and "Hati" meaning marketplace.[16] The mention of betel nut was made as early as sixth century in Skanda purana.[17]

Similarly, in Assam, it is a longstanding tradition to offer *pan-tamul* also called as goi phatai (betel leaves and raw areca nut respectively) to guests immediately upon arrival, after tea, or after every meal. It is served in a brass plate with stands (Sorai or *Batha)*. Among the Assamese, it also has a prominent place during religious and marriage ceremonies, as a symbol of fertility.[18] During Bihu, the *husori* players are offered *pan-tamul* to solicit blessings.

Cancer esophagus is one of the most commonly diagnosed cases in Assam, and betel nut chewing is the culprit. In a case–control study done by Phukan et al among 501 newly diagnosed patients, the highest risk was associated with the use of fermented betel nut without any tobacco. Risk also increases with earlier onset of habit and correlates directly with the number of times it was consumed per day.[19]

The prevalence of doma consumption in Bhutan is 45% and it is more common in females, armed forces personnel, professionals, rural residents and it was less common in people with higher education.[7] Doma forms a red juice that colors the teeth and lips with a red hue. Chewing doma results in feeling of flushing and leads to warmth. Such use in winters ultimately leads to addiction. In many Bhutanese cultures, spitting is frowned upon. Hence, the consumer swallows the juice from chewing doma. This compounds the carcinogenic effect on the oral cavity, esophagus, and stomach.

The overall incidence of all cancers is high in Bhutan (572 cases for a population of around 0.7 million, corresponding

Table 1 Risk factors for head neck carcinomas in Bhutan ($n = 572$; [3])

Cancer site	Chewing betel nut	Drinking alcohol	Smoking tobacco	Chewing tobacco	Sniffing tobacco
Oral cavity	41	26	17	28	04
Oropharynx	17	12	15	11	01
Larynx	16	17	14	06	01
Hypopharynx	25	20	18	14	01
All of the above cancers	99 (17%)	75 (13%)	64 (11%)	59 (10%)	07 (1%)

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mortality of 456 deaths). As per GLOBOCAN 2020, the commonest malignancies in Bhutan are those of stomach (20.6%), lung (8.2%), cervix (8.2%), esophagus (7.3%), and liver (5.9%). Cancers of lip, oral cavity, oropharynx, hypopharynx, and larynx together form 8.6% (lip and oral cavity together contributing 3.7%).[2]

A 7-year study by Tshering et al was conducted at Jigme Dorji Wangchuk National Referral Hospital between 2011 and 2017.[3] A total of 515 head neck cancers cases were documented. The age standardized rate was 12.3 (95% confidence interval: 9.5–15.1) per 100,000 population (incidence less than two others—stomach cancer and cervical cancer)—the commonest being thyroid cancer, oral cavity cancer, and cancer of hypopharynx. Squamous cell carcinoma was the most common histopathological type in almost all the cases, while papillary carcinoma is the commonest among thyroid cancers. Associated risk factors are shown in ►Table 1.[3]

As cancer has become the major public health issue, its control has become the national priority. Health education plays essential role in control of cancer. The numerous ill effects should be highlighted through the social media, newspapers, television, and other means of dissemination. This will certainly help to some extent in cancer control. Adopting healthy lifestyles and reducing doma, alcohol, and smoking will make the happy country happier. While Bhutanese culture has many rich traditions of immense value, chewing doma should no longer be the matter of pride. This is vital to reduce the cancer burden across the nation.

This objective might be facilitated by an unintended ally. The cost of doma is increasing significantly in recent times. Nu 10 (Bhutanese Ngultrum; equivalent to USD 0.12) now fetches only two Khamtos (readymade doma). The erstwhile lucrative business of selling doma is feeling the pinch. To shops, a pon (80 pieces of doma) costs Nu 420 (USD 5.15). Retailers used to divide this into set of six pieces of doma. Now they have reduced the retail pack size to only five. With the per capita gross domestic product of Bhutan being Nu 2,83,695 (USD 3500), daily consumption of six Khamtos (Nu 30; USD 0.36) will dent an individual's monthly by Nu 900 (USD 11). It seems the increase in the cost of goods goes all the way back to the source of supply from Gelephu and Phuentsholing; market forces responding to decline in Doma production.[12] We recommend the authorities consider using the slogan "Don't chew your way to cancer, say no to doma" widely—especially across social media.

Conclusion

The usage of areca nut has been associated with morbidity and mortality due to carcinogenic effect of its ingredients. Dependence is due to individual as well as deep-rooted cultural factors. Important reasons for extensive usage are easy availability in homes, markets, and commonly perceived health benefits of its usage. Addressing this addiction needs multipronged approach, similar to tobacco control; however, it is more challenging due to socially accepted tradition. Seemingly an individual level of dependence and addiction, the issue is of national importance to address, due to the vast burden of cancers it is associated with, in India as well as Bhutan.

Conflict of Interest

None declared.

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