

# Effect of Areca Nut on Oral Health: A Review

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## ABSTRACT

**Background and Aim:** Oral health can be influenced by habitual areca nut chewing. The consumption of products containing areca nut, such as paan, gutkha, supari, etc., is common in Asian countries, such as India, Bangladesh, and Pakistan. In Iran, areca nut product consumption is common in the southeast of Iran, especially in Chabahar, Iranshahr, and Nikshahr cities, which are in proximity to the Pakistan border. These products are easily accessible in these areas and are widely used due to a lack of awareness about their disadvantages. Areca nut contains tannins and alkaloids, such as arecaidine, guvacine, arecoline, and guvacoline. Arecaidine can stimulate the synthesis of collagen by stimulation and proliferation of fibroblasts. This review article aims to evaluate the effects of areca nut on oral health.

**Materials and Methods:** Research was performed in the PubMed, ScienceDirect, Web of Science, Google Scholar, and Scopus databases, and 35 articles were selected in total.

**Result:** By reviewing the studies, it was found that areca nut products cause periodontal disease as well as oral lesions, which can become malignant with continuing use.

**Conclusion:** Areca nut product chewing has deleterious effects on oral and dental health. Tooth fracture, periodontal disease, leukoplakia, lichenoid lesions, oral submucous fibrosis (OSF), and oral cancer can be correlated with areca nut use. Therefore, public health proceeding to discontinue areca nut consumption is advised to control premalignant and malignant lesions, such as OSF and oral cancer.

**Keywords:** Areca, Habits, Oral Health

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## Introduction:

Areca nut use is a habit of a great ancient history. This habit is universally accepted among some sections of the society, including children and females. The reasons for the popularity of areca nut chewing are as follows: addiction, social acceptance, religious beliefs, and understood health benefits.<sup>(1,2)</sup>

Different products, like khaini, pan masala, mawa, paan, and gutkha, contain areca nut.

Areca nut (or betel) is the fourth most prevalent used psychotropic substance across the world after caffeine, alcohol, and nicotine. Some reasons for areca nut chewing are pain relief, euphoria, refreshment, increasing saliva, etc.<sup>(1,3)</sup>

Habitual areca nut chewing can be deleterious

to human health. The World Health Organization (WHO) knows areca nut, as a psychoactive substance, as group 1 human carcinogens.<sup>(4,5)</sup>

Habitual areca nut chewing is very common in Southeast Asia but due to its widespread use, it has spread to North America and Europe. The mortality rate of habitual areca nut chewing is significant because it can cause oral squamous cell carcinoma (OSCC; 2.3%-7.6%).<sup>(1,6)</sup>

Areca nut is an endosperm of the fruit of the catechu tree (Figure 1). It is composed of tannins, which among them, de catechol and lottanic acids are the most important. Areca nut is composed of alkaloids, including arecoline (the most abundant), arecolidine, guvacine, guvacoline, and arecaidine, which their amount in areca nut is low.



Figure 1. Areca nut fruit and its preparation



Figure 2. Paan and supari

### Materials and Methods:

This study is a simple overview (2020) by searching the Google Scholar, PubMed, Scopus, ScienceDirect, and Web of Science databases (about 35 articles) with the following keywords: areca nut, habits, and oral health, from 1990 to 2020.

Resources in which the effects of areca nut-derived products on oral and dental health were reported were used whereas old studies or studies that had only reported the epidemiology of the related diseases without describing the effects of areca nut usage were excluded from the study.

### Results:

By reviewing the studies, it was found that areca nut products cause periodontal disease as well as oral lesions, which can become malignant with ongoing use.

### Discussion:

Areca nut use can be harmful to oral and dental health. Some harmful effects of areca nut chew-

ing on dental health are as follows:

**Tooth abrasion and fractured teeth:**

Areca nut chewing can lead to occlusal abrasion and tooth fracture due to its hard fibrous nature. Shortening of the incisors is one of the complications of betel or areca nut chewing. In areca nut chewers, occlusal surfaces of the premolars and molars become smooth. Enamel abrasion and dentinal sensitivity often occur.<sup>(16,17)</sup>

**Areca nut staining:**

Copious red saliva is produced following areca nut chewing. In addition, polymers of ortho quinones discolor the teeth. Tooth discoloration depends on the duration of areca nut use and differs from red to black (Figure 3).<sup>(1,16)</sup>



Figure 3. Dental staining in an areca nut user

**Tooth decay:**

Regular areca nut chewing diminishes tooth decay due to the following reasons:

- 1-Production of sclerotic dentin following dental attrition.
- 2-Areca nut stain coats dental surfaces and it may protect against demineralization of the teeth.
- 3-Antimicrobial properties of tannin of areca nut.
- 4- Increased salivary pH following areca nut chewing.

Some epidemiological studies have indicated that the rate of dental caries in areca nut chewers is lower than that in non-chewers.<sup>(18)</sup> Other studies have reported no differences in dental caries between areca nut consumers and non-consumers.<sup>(19)</sup>

The impact of areca nut usage on the oral mucosa:

Whitish gray discoloration of the oral mucosa occurs in some areca nut chewers. Others may have healthy mucosa without discoloration or textural change.<sup>(1,20)</sup>

Lichenoid lesions and oral leukoplakia following areca nut use:

There are reports about lichenoid oral lesion

development following areca nut use. These lesions often occur at the site of placement of areca nut products. With habit cessation, this lesion may regress completely.<sup>(21)</sup>

Oral leukoplakia generally occurs as a white plaque or patch on the oral mucosa and is not characterized pathologically or clinically as any other oral lesion. It may be related to tobacco use in some cases. It has been reported that areca nut product consumption is a major risk factor for oral leukoplakia development.<sup>(22)</sup>

SCC:

It has been indicated that long-term areca nut chewing can lead to OSCC development (Figure 4). Areca nut and its derivatives have been known as human carcinogen type 1. Products containing areca nut and tobacco increase the relative risk of OSCC development.<sup>(1,23)</sup> Areca nut and betel quid are strong and independent risk factors for oral cancer.<sup>(24)</sup>



**Figure 4. Transformation of oral leukoplakia to oral squamous cell carcinoma (OSCC) in an areca nut user**

OSF:

OSF is a precancerous condition with the highest malignant potential among oral mucosal lesions. The most common factor for OSF development is areca nut use.<sup>(6,25)</sup>

Areca nut causes overproduction of collagen by fibroblast stimulation. Overproduction of collagen and its deposition in the soft tissue of the oral mucosa decrease the flexibility of the oral mucosa.<sup>(1,6)</sup>

OSF manifests as a severe reduction in mouth opening and rigidity and blanching of oral soft tissues (Figure 5). Most people afflicted by OSF attend to dental clinics due to the reduction of mouth opening and rigidity of the oral mucosa, leading to difficulty in speech, chewing, and swallowing.<sup>(14,16)</sup>

OSF is more common in men in the third decade of life. It commonly occurs in the buccal mucosa and the palate.<sup>(6,26)</sup>

This condition is irreversible, and there is no effective treatment for this premalignant lesion. If OSF is left untreated, the lesion would transform to OSCC. Therefore, preventing OSF is very important. Many studies show that areca nut use has a strong correlation with OSF. Based on the findings of these studies, the most important factor contributing to OSF development is areca nut product use. Factors such as the frequency, amount, and duration of areca nut consumption are correlated with OSF development.<sup>(6,15,25-29)</sup>

OSF has the highest malignant transformation potential among oral precancerous lesions. Although epidemiological studies have revealed that the essential factor for OSF development is areca nut consumption, other factors such as tobacco, lime, and chilies consumption, as well as immunological disorders, genetics, nutritional deficiencies (iron and zinc), and collagen disorders contribute to OSF development.<sup>(1,6,8,25)</sup>

Several treatment modalities have been presented for relieving the symptoms of OSF but none of them leads to complete resolution of the disease.<sup>(6)</sup>



**Figure 5. Limitation in mouth opening and blanching and rigidity of the oral mucosa in an oral submucous fibrosis (OSF) patient**

OSF treatment modalities:

Habit cessation: The first and most important step of treatment is the cessation of the habit of areca nut chewing. Education regarding habit cessation and ending the use of areca nut products and irritants such as spicy and hot food, smoking, and alcohol consumption are important for the promotion of oral health in areca nut users.<sup>(6,29,30)</sup>

**Steroid therapy:** Steroids act by the reduction of fibroblast proliferation, which decreases the number of collagen fibers. The release of cellular protease enzymes in the extracellular compartment by steroids in the connective tissues causes collagen and zymogen activation, leading to the ingestion of insoluble collagen and stimulation of collagen breakdown.

Intralesional injection of dexamethasone as well as the use of steroid ointments are usually advised.<sup>(6,31,32)</sup>

**Immune milk:** One of the anti-inflammatory components used in recent years to relieve symptoms in patients with OSF is the immune milk, which relieves the symptoms in OSF patients with stimulation of cytokine production and suppression of inflammatory processes.<sup>(33)</sup>

**Turmeric powder:** Turmeric powder, as an excellent scavenger of free radicals, is used for OSF treatment. The mechanism of the effect of turmeric powder is through the production of micronuclei in circulating lymphocytes influenced by Benzo(a)pyrene in turmeric powder. Turmeric resin and turmeric oil synergistically protect cells against DNA damage.<sup>(6)</sup>

**Interferon-gamma (INF- $\alpha$ ):** INF- $\alpha$  is an antifibrotic cytokine, which regulates the immune system. Intralesional injection of INF- $\alpha$  for patients with OSF relieves the symptoms.<sup>(6,34)</sup>

**Physiotherapy and Surgery:** One method of prevention of mouth opening reduction is muscle stretching exercises thorough physiotherapy. OSF patients with severe trismus can be cured with surgical intervention under general anesthesia, which consists of excision of fibrotic bands and reconstruction along with myotomy of the temporalis muscle as well as coronoidectomy.<sup>(6,35)</sup> However, surgical intervention and pharmacotherapy do not eliminate the disease, especially if the habit of areca usage is continued.

In a systematic review, by evaluation of 28 articles about areca nut hazards, the authors explained that areca nut chewing is associated with cardiovascular disorders, cerebrovascular disorders, obesity, hyperglycemia, metabolic syndrome, type 2 diabetes mellitus, hepatic disorders, esophageal inflammation and fibrosis, respiratory discomfort, and renal disorders.<sup>(35)</sup> Areca nut chewing adversely affects systemic

health by damaging vital organs. Therefore, general human health as well as oral health are influenced by areca nut use.<sup>(36)</sup>

### Conclusion:

Based on the collected contents from reliable sources on the harmful effects of areca nut on oral and dental health, it can be concluded that betel quid and areca nut usage in any form is unsafe for oral and dental health. Considering the reviewed literature, dental hard tissues and oral soft tissues are influenced by areca nut use. Areca nut and its derivatives have deleterious effects on the oral mucosa. These products have harmful effects on periodontal tissues and dental health. In areca-retained sites, especially in chronic betel nut chewers, lichenoid lesions and leukoplakia arise. OSF and oral cancer result from long-term areca nut chewing combined with tobacco; therefore, it is necessary to control the areca nut habit epidemic in different societies. For limitation of the prevalence of areca nut use, health care professionals must increase awareness of users regarding the harmful effects of areca usage as well as the signs and symptoms of OSF and OSCC. The consumers should be taught about the health risks of areca nut consumption through educational programs. Quick identification of oral lesions and timely and effective care are essential to decrease the mortality rate.

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