

## Khat - Its Effects and Associations with Oral Health and Oral Cancer

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**Received:** February 12, 2020

**Published:** February 20, 2020

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### Abstract

Khat or Qat (*Catha edulis*) is a plant growing in East Africa and southern Arabia. Millions of people worldwide chew the leaves and twigs of this tree for its stimulating amphetamine like effects. Furthermore, migration has resulted in the rise in the number of Khat chewers across the United States and Europe.

Long-term khat chewing has several detrimental general and oral health effects. The aim of the essay is to elucidate the oral and dental effects of khat use, with particular emphasis on its link with oral keratotic white lesions and oral cancer as well as oesophageal cancer. Khat is associated with several oral and dental conditions, including keratotic white lesions, mucosal pigmentation, periodontal disease, tooth loss, plasma cell stomatitis, and xerostomia.

The objectives of this essay therefore are to educate and update health professionals on khat use and its associated oral adverse effects with particular emphasis on its link with oral keratotic white lesions and oral cancer. This has been undertaken in light of the absence of substantial literature on such associations and to provide a context that could be used to identify themes for future research.

**Keywords:** Khat; Oral Mucosa; Dental Health; Oral Cancer; Oesophageal Cancer

### Introduction

Khat (also known as qat, kat, and miraa) is an evergreen plant (*Catha edulis*) that belongs to the Celastraceae family. Khat chewing is particularly prevalent in countries like Yemen, Kenya, Ethiopia, Djibouti, Eritrea, Somalia, and Saudi Arabia [1,2]. Many people from diaspora communities living in Europe, the USA, Canada and Australia also chew khat regularly.

The main active psychoactive compounds of khat are cathinone, an amphetamine-like sympathomimetic amine, and cathine. Various other compounds are found in khat, including a complex group of at least 62 alkaloids, carbohydrates, tannins, flavonoids, terpenoids, sterols, glycosides, vitamins (particularly vitamin C), non-toxic metals, and amino acids [2,3].

Khat was essentially chewed in social gatherings (khat sessions), as a pastime activity or during wedding ceremonies. It is usually used by drivers, labourers, and even students for its reinforcing properties [4]. This habit involves inserting fresh leaves of khat into one side of the mouth and chewing it; the juice is swallowed, and the chewed materials are kept in the buccal sulcus forming a bolus, either unilaterally or bilaterally for several hours [5,6]. Given that khat chewing has a drying effect on the oral mucosa, its users tend to consume a large quantity of non-alcoholic fluids, such as water, coffee, and carbonated soft drinks. Some khat users also supplement their chewing practice with tobacco smoking and refined sugar [7].

### Global prevalence

It is estimated that over 20 million people worldwide are habitual khat chewers. This habit is highly prevalent in countries where khat is cultivated, particularly in Yemen, Somalia, Ethiopia, Djibouti, and Kenya [2,9]. The habit is also practiced to a lesser extent in Uganda, Tanzania, Rwanda and Zimbabwe [2]. In Yemen, khat chewing is a particularly deep-rooted habit, and recent epidemiological data show that more than 70% of men and 30% of women are daily khat users. In Djibouti, it is estimated that 90% of the population chew khat regularly [2,9].

### General effects

Long-term khat chewing has been associated with several adverse systemic health effects, including gastrointestinal disorders, obstetric disorders, cytotoxic effects on liver and kidneys, respiratory problems, mental illnesses, and cardiovascular disorders, such as hypertension and increased risk of myocardial infarction [1,2]. Long-term use of khat could also lead to sexual impotence and reproductive problems [1]. Khat is also genotoxic and teratogenic, and if consumed by pregnant women, could adversely affect foetal growth. Central nervous system deficits along with schizophreniform psychotic disorder, paranoid delusions, mania, as well as an apparent increase in suicidal depression and hallucinations.

### Specific oral and dental manifestations of khat

Khat use has also been reported to have detrimental effects on dental and oral tissues. These include periodontal diseases, dental discoloration and attrition, temporomandibular joint disorders,

plasma cell stomatitis, mucosal pigmentation, keratotic lesions, and xerostomia [3,6,9,10]. Furthermore, some investigators have suggested a possible link between khat chewing and oral cancer [10,11].

Limited yet conflicting studies show that low caries level can be attributed to the amount of fluoride in khat leaves. It is worth mentioning that while khat in itself is considered to be a non-cariogenic, high consumption of sugary soft drinks and concomitant use of sugar tablets or powder to counteract the bitter taste of khat leaves could be the reason for high prevalence of caries among khat chewers. Additionally, xerostomia induced by cathinone (the main constituent of khat) could be another contributory factor for caries. The exact etiology of occlusal attrition among chewers is still unknown. Nevertheless, it could be attributed to the occlusal trauma resulting from continuous khat chewing which lasts for several hours at a time.

Teeth discoloration was attributed to the stain caused directly by the chemicals (tannins) in khat leaves.

Continuous use of the temporomandibular joint in the relentless chewing as well as oral muscles lead to complaints of TMJ clicking, facial pain and asymmetry.

Khat consumption has been known to cause gingival bleeding and Plasma cell gingivitis probably similar to Type IV hypersensitivity reaction to toothpaste and chewing gum.

#### Microbial aspects

The effect of khat on periodontal bacteria identified from subgingival and supragingival plaque, The aqueous crude extracts of khat were demonstrated to possess selective antibacterial activity against periodontal bacteria. Khat extract was shown to interfere with the formation of adherent biofilms by *Streptococcus mutans*. It is associated with higher levels of some health-compatible periodontal bacteria, such as *Viellonella parvula*, and lower levels of the periodontal pathogen, *Tannerella forsythia*. It suggests a prebiotic effect of khat on periodontal microbiota [12].

#### Keratotic white lesions

Long-term khat chewing has been associated with changes ranging between slight whitening of the mucosa to frictional keratosis with severe corrugation. Tannins, the phenolic compound present in khat, are known to increase the thickness of the mucous membrane of the oropharynx and esophagus.

The reported histopathological changes in the oral mucosa on the side of chewing were acanthosis, abnormal rete ridges, intra-cellular edema, hyperkeratosis, increased epithelial thickness affecting all layers, and inflammatory cell infiltration in the subjacent connective tissue.

Mucosal pigmentation and Hairy tongue related to khat chewing has also been reported in the literature [5,6,10].

**Figure 1:** Typical Khat Bolus in cheek of Khat chewer and Khat leaves.

**Figure 2:** Khat-induced keratotic white lesion at the chewing side.

#### Oral cancer

One of the most important considerations from an oral health point of view is the questionable relationship between khat chewing and the development of oral cancer [10,11]. Interestingly, it has been noted that some of their oral cancers had developed in the exact same site where the khat bolus (the lump of chewed leaves) was held.

There is experimental evidence from recent in vitro studies that khat extracts have been shown to induce apoptosis and G1-phase arrest in oral keratinocytes and fibroblasts, which further adds to speculations about the carcinogenicity of khat [13,14].

As noted earlier, there is not enough evidence in the literature that khat chewing alone is carcinogenic or that it plays an independent direct role in the development of head and neck cancers. Unfortunately, the frequent, combined use of khat and tobacco products in its different forms makes it difficult to assess the confounding effect of each agent on the risk of developing oral cancer, and to the best of our knowledge, no research to date has evaluated

the effects of the khat-tobacco combination on oral mucosa, and whether there are any synergistic effects on cancer risk when both products are concomitantly used.

The concomitant use of Tobacco with Khat causes the potentiation of detrimental effects of each other in the causation of malignant and premalignant oral lesions. It has been reported that up to 61% of khat chewers smoke cigarettes, and that smokers usually consume more cigarettes during khat chewing sessions with consumption of various tobacco products, such as cigarettes, water pipe, or shisha only during khat chewing.

## Conclusion

In summary, as the prevalence of khat use is rising worldwide due to global immigration from areas of high use, the incidence of khat-related lesions could potentially increase worldwide, and therefore, the diagnosis of such lesions could be challenging for some physicians (especially in the West and those practicing in countries where khat is not a common habit) due to a lack of awareness about the habit and its association with oral and oesophageal lesions. Therefore, such habits should be taken into consideration in differential diagnoses of oral lesions with clinical findings, especially among people of different races and ethnicity. There is an urgent need to develop and implement new and strict government policies to regulate the sale and import of these products in an effort to reduce the toxic effects of khat on people addicted to this substance.

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