

## The Green Leaf: Khat Chewing and Mental Illness

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### ABSTRACT

*Khat chewing is traditionally a habit in Yemen and some African countries such as Ethiopia, Somalia and Kenya, as well as among emigrants from these countries in different parts of the world. In the last few decades, there is rising concern among international health authorities that khat has harmful medical and mental effects related to excessive khat use. A relationship between khat use and mental illness has been suggested by clinical case reports and quantitative studies. This article provides literature reviews of clinical case reports and quantitative studies to the reported 'mental illness of khat to chewers that presented in the international literature. This is a review partly based on a report of Warfa et al. 2007, WHO 1980, 2006, and Advisory Council on the Misuse of Drugs Dependence (ACMD) 2013. A literature search of a large number of medical databases, including via Google, Medline, PubMed, as well as the Internet was made to identify relevant reports up to 2023. Case report studies or literature do not clarify the confusion on khat effects, in addition to insufficient evidence between khat use and psychosis, the reports are contradictory, and inconclusive to attribute that khat use causes mental illness particularly psychosis.*

### Keywords

Khat, Catha edulis, Qat cathinone, Psychosis.

### Abbreviations

WHO: World Health Organization, INCB: International Narcotics Control Board, ACMD: Advisory Council on the Misuse of Drugs.

### Introduction

Khat (*Catha edulis*) evergreen shrub of the family Celastraceae [1] has a deep rooted socio-cultural tradition. Khat is grown commercially at high altitudes in the region extending from eastern to southern Africa (Ethiopia, Somalia, Kenya, Malawi, Uganda, Tanzania, the Congo, Zambia, Zimbabwe.), as well as on the Arabian Peninsula (Yemen) and naturally in Turkestan and Afghanistan. Khat (from the *Catha edulis* tree) consumption is a common habit in certain countries of East Africa and Yemen [2] and Southern Saudi Arabia [3]. Khat has become a worldwide phenomenon broadening to ethnic communities in the rest of the world. During the last decades, due to the development of road

networks and the availability of air transport, the habit has spread considerably to Europe and US [4,5]. Chewing khat is both a social and a cultural activity. Khat leaves have been chewed for centuries for their mildly stimulating properties as part of their social life and cultural heritage. Khat chewing enhances social interaction, playing a role in ceremonies such as weddings births, marriages, funerals. The chewing of khat leaves is usually chewed in social gatherings with family and friends. Khat may be used individually to enhance working capacity [6]. Khat chewing is traditionally a habit in Yemen and some African countries such as Ethiopia, Somalia and Kenya, as well as among emigrants from these countries in different parts of the world.

In the last few decades, there is rising concern among international health authorities that khat has harmful medical and mental effects related to excessive khat use. The effects of khat were reviewed by a WHO report in 1980 [7]. There have been sporadic reports and quantitative studies of a possible association between khat use and the occurrence mental illness in particularly psychosis.

Several authors have addressed the human aspects of khat use with particular reference to the issue of physical effect [1,2,8,9] behavioural and psychiatric aspects [2,7,8,10-21] and potential tolerance capacity, psychic and physical dependence [1,2,8,12,21-26]. Accordingly, there is rising accord among international health authorities that khat has harmful mental effects related to excessive khat use. However, there is little systematic evidence of a consequent rise in harms associated with khat use. Some the scientific literature suggests association between khat use and the occurrence mental illness particularly psychosis. Psychosis due to khat use is considered by many authors to be rare phenomena. On the other hand, others concede that khat chewers suffer mental disorders but see no direct association between chewing and any form of psychosis. When it comes to the effect of khat chewing on mental health, the sporadic case reports and quantitative studies are not just inconclusive but also contradictory that attributed to khat chewing gives one the impression that khat tree is the main cause of mental disorders in terms of scholar working in this field. This paper will review the scientific literature on the relationship between khat use and mental illness in particular psychosis.

### Prevalence

In a large-scale survey in three in different zones including three urban and three rural areas, covering 800 Yemeni adults, Numan [21] found a lifetime khat use of 82% of men and 43% of women. There was a high incidence of khat use in the entire Yemeni population (67.9%); current every day use of khat was found in 23.6% of the total sample (men 31.8%, women 8.9%). In Ethiopia, Alem et al. [27] found that more men habitually chewed than women: 75% of men chewed khat regularly compared with only 7–10% of women. In Uganda, a cross-sectional survey carried out in three towns in southwestern Uganda, 32% of participants had a lifetime experience of khat chewing and 20% were current chewers [28]. In the UK, the chewing of khat is largely confined to ethnic communities accustomed to its use, such as the Somali community [13,29] found among Somali refugees (180) in the UK, a higher prevalence of khat use in men (63%) than in women (17%). In the last decades, the khat habit has spread to other African countries and to Europe, to Australia and to the United States; where it is practiced by immigrant groups [30].

### Legal Aspects of Use

In 1973 the WHO expert committee listed khat as a dependence producing drug, and initiated basic research on khat [31]. The WHO [7], advisory group found that the pharmacological effects of khat chewing were analogous to those of amphetamine and that khat abuse was similar to amphetamine addiction. An international conference was held in 1983, but it was inconclusive. In 1985, cathine and cathinone, the two main active ingredients of khat, were assessed as meeting the criteria for control under the Convention of Psychotropic Substances and recommended for scheduling [17]. In 2002, a critical review on whether the plant itself needed to be placed under international control [32]. But, WHO concluded in 2006 that scheduling was not required, the Committee reviewed the data on khat and determined that the potential for abuse and dependence is low [33]. The conclusion of

the WHO Expert Committee blocked the option of bringing khat under UN control, clearly to the frustration of the International Narcotics Control Board (INCB), and a strong recommendation by the INCB that khat should be brought under international control (INCB) [34]. The Advisory Council on the Misuse of Drugs [24] believes that it would be inappropriate to classify khat under the Misuse of Drugs Act 1971 and that the evidence of harm resulting from khat use is not sufficient to recommend its control. The UK's Advisory Council on the Misuse of Drugs [25] recently reviewed evidence pertaining to khat harms and reported its findings in January 2013. As with its 2005 review [24], it recommended that khat should not be controlled in the UK.

Khat consumption came to public attention in the UK in the late 1980s; this led to a first report being commissioned on khat in the UK by the National Drugs Intelligence Unit (NDIU 35). The report found no link to psychosis, concluding that khat consumption was unlikely to spread beyond Somali and Yemeni immigrants. Restriction was considered unnecessary [35]. Accordingly, there is view that khat (cathinone) may contribute to or cause mental illness particularly psychosis. The use of khat and the potential socioeconomic and health hazards it poses have also been a cause for increasing concern in various regions around the world, including Europe, North America, Canada, and Australia mainly as a result of immigrants from traditional use regions who bring with them the custom of chewing khat [36,37]. To this date, the potential mental health risks, and benefits of khat chewing are sources of increasing policy and academic debates [38].

### Chemistry

The major psychoactive ingredient is the phenylalkylamine (–) – alpha aminopropiophenone named as Cathinone [7,31,39]. Cathinone is a psychostimulant structurally similar to amphetamine [14,40,41]. Cathinone has pharmacological properties [7,42] and effects similar to amphetamine both at central and peripheral catecholaminergic synapses [43,44] The potency of cathinone to release dopamine in the striatum and nucleus accumbens, is similar to amphetamine [45-47].

### Method

This study provides a literature review of clinical case reports and quantitative studies to the reported 'mental illness of khat to chewers that presented in the international literature. This search partly based on a report of Warfa et al. 2007, Pennings 2008, WHO 1980, 2006, and Advisory Council on the Misuse of Drugs Dependence 2013, and the relevant papers till 2023. A literature search of a large number of medical databases, including via Google, Medline, PubMed, as well as the Internet was made to identify relevant reports up to 2023.

### Case Reports: Outcome Reported

Case reports that published in literature and scientific journals since 1945 stated that khat ingestion or khat abuse precipitated or caused insanity or symptoms of manic psychosis, hypomania, manic psychosis with grandiose delusions, induced psychotic states, such as a paranoid or schizophreniform psychosis

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with persecutory delusions associated with mainly auditory hallucinations, hypnagogic hallucinations, aggressive behaviour and homicide and suicide among users. These sporadic reports described the association between khat use and the occurrence of hypomania, paranoid, aggressive behaviour, psychoses among users [11-13,15-19,48-54] and mood and behaviour [1,55-57]. Whilst khat psychosis by many authors is to be rare phenomena [7,8,58-60].

- Ingestion of khat caused symptoms of manic psychosis [12].
- Khat induced schizophreniform psychosis [13].
- Khat use should be enquired after in patients from this region (Ethiopia) and presenting with psychotic illness [16].
- Khat induce at least two kinds of psychotic reaction [17].
- Khat chewing as a cause of psychosis [18] and caused a paranoid psychosis.
- Insanity was clearly precipitated by a herb *Catha edulis* [48].
- Khat psychosis could be an increasing occurrence in Australia [49].
- Khat induced hypnagogic hallucinations [53].
- Khat induced psychotic disorder [55].
- Chewing Khat caused a paranoid psychosis [61].

All case reports which cannot demonstrate or prove a causal relationship. Concerning mood and behaviour [1,56,57] have reported no abnormal pattern or any indication of a rush of excitement or loss of physical or mental control during traditional khat sessions. Whilst psychosis due to khat use have been considered by many authors to be rare phenomena [7,8,58-60]; the case reports have described the occurrence of khat induced acute psychotic episodes in a small number of cases [58].

### Quantitative Studies: Outcome Reported

- Mental disorders have been identified as being associated with the use of khat. Few quantitative studies have addressed the relationship between khat use and mental health problems [27,62-76].
- Some quantitative studies reported moderate or severe mental health problems associated with khat use [20,62-64,67-70,73,77-80].
- Other studies focus on a depression, anxiety, stress [20,69,70,80,81], suicidal attempts [55,69], human mood [82], mental distress [83] and paranoid ideation [84].
- Others focus on psychological harms associated with its use include psychosis and depression, which in some cases have resulted in acts of suicide and homicide [85-88].
- Very few studies used quantitative analysis of the connection between excessive khat use and psychosis [64,72-74].
- On the other hand other studies found no significant associations between khat use and mental disorders [21,27,38,65,66,68,89-91].

Most studies suffer from confounding; some studies maintain that khat causes psychological disturbances. Others reported that khat chewers suffer mental disorders but see no association between chewing and mental disorders.

## Discussion

Psychosis due to khat use is considered by many authors to be rare phenomena [2,7,23,60,92], others see no direct association between chewing and any form of psychosis [93]. Regarding relation between psychosis and khat use; Halbach [8] explained the rarity of khat induced psychosis due to the way in which khat is consumed does not permit the plasma level to raise high enough for toxic psychosis to be produced, and most reports of the association are of exacerbation of psychosis in predisposed individual. The WHO advisory group [7] found that the pharmacological effects of khat chewing were analogous to those of amphetamine and ACDM [25] reported that khat is a much less potent stimulant than other commonly used drugs, such as amphetamine or cocaine. To strengthen the case for a causal association, some authors have compared the similarities between the pharmacological aspects of khat to other amphetamine-like psycho-stimulant substances or drawn a parallel with other evidence of an aetiological role for illicit drugs such as the link between cannabis use and the onset of schizophrenia [89]. Case reports were based on the similarities between the pharmacological action of khat and amphetamine. Therefore, any risk assessment based on the amphetamine analogy would be inadequate and unjustified [89].

The systematic review by Warfa et al. [89] suggests that whilst khat-induced psychiatric problems are frequently reported in case studies, the balance of evidence suggests that khat alone does not directly cause mental disorders. All case studies reported a causal relationship between khat use and psychoses or psychotic symptoms. Only the authors of the clinical case studies reported a causal association between excessive khat use and psychosis, they are unable to offer evidence as to causality [89]. Most of cases were refugees or immigrants in UK, and seeking political asylum, anti-government movement, unemployment, social exclusion and stressful life events [17,18] and drug /alcohol, socioeconomically handicapped position and culturally isolated state such as exile, immigrant etc. [21]; these are risk factors that contributed to the general confusion about khat use and psychosis [89] and development of symptoms in several ways [6].

The evaluation of khat in this respect is presented in the international literature recently suggested that the case reports evidence distorted the scientific debate and was not reflecting the population based risk of psychosis among people consuming khat, that creates a confusion about the adverse psychological problems of khat usage [89]. The absence of a positive association between the incidence of psychological symptoms is perhaps surprising [21]. It is quite possible that khat, taken by banch chewing (the main form in Yemen), would rarely yield plasma levels needed for the development of psychosis [8,21].

### Khat and Mental Illness

Griffiths et al. [67] reported some adverse psychological problems were associated with khat use. Some authors [63,76,82] reported only moderate associations between khat use and mental health. Whilst Dhadphale and Omolo [62] studied psychiatric morbidity

among khat users; in moderate users there was no excess morbidity and chewing more than two bundles per day was associated with increased psychiatric morbidity. On other hand, Litman et al. [66] found that the prevalence rate of psychopathology was not higher among khat users than among abstainers, mental distress has not been shown to be associated with khat use [27] and the level of psychological dysfunction was similar in both khat users and nonusers [68]. Other studies [94-97] show a significant association between khat use and mental disorders, in particular depression, anxiety and/or stress. Bhui et al. [70] found an association between khat use and mental disorder; they made no assessment of khat use and specific mental illness such as depression, PTSD, anxiety, panic disorder and psychosis, partly because all these psychiatric diagnoses were aggregate into binary variables, with any mental disorder as an outcome [89]. Previously, mood and behaviour [1,56,57] have reported no abnormal pattern or any indication of a rush of excitement or loss of physical or mental control during traditional khat sessions.

Quantitative studies focused on the link between psychosis and khat use among migrants. Many of the published reports relating to khat-induced psychoses concern individuals, who have immigrated to Europe, UK, US, become culturally isolated and are in vulnerable socio-economic situations. The majority of the studies are conducted on immigrants from traditionally khat-chewing regions, and it is not clear whether the development of psychosis is due to migration experiences or social isolation in destination countries [38]. Some studies focused on highly traumatized migrant populations making findings inconclusive as to whether the trauma or the khat triggered the psychosis [74]. In the same way Onger et al. [73] reported that based on the cross-sectional nature of their study design it is difficult to conclude on what came first, whether khat itself caused psychosis or whether the participants with existing psychotic disorders used khat in an attempt to alleviate psychotic symptoms. Bhui et al. [71] suggests that severe mental health problems such as psychosis, depression or post traumatic stress disorder in khat using UK Somali immigrants are not associated with frequency of khat use but rather were linked to earlier traumatic events [86,99,101].

Furthermore, several surveys reporting khat-induced psychoses involved subjects who were taking the substance (khat) in an unfamiliar setting (UK, US), often in a socio-economically handicapped position and culturally isolated state (exile, immigrant, etc.) [6,21]. These specific conditions may have contributed to the development of symptoms in several ways. Overall, it appears that khat use is not necessarily linked to psychological morbidity; any association that is found may reflect an interaction with other environmental factors. With reference to psychosis, very few studies used quantitative analysis of the connection between khat use and psychosis [72-74,84]. Odenwald et al. [64] study reported significant correlations between excessive khat use and psychotic symptoms. The results indicated that not khat consumption per se but rather early onset and excessive khat chewing were related to psychotic symptoms. Similarly, very few studies [quantitative

analysis] found connection between khat use and psychosis [72-74]. In cross-sectional household survey, Onger et al. [73] reported that psychotic symptoms were significantly elevated in khat users. Interestingly, their study reported that strange experience and hallucinations are significantly associated with khat; but they reported in same study that after combining all psychotic symptoms (mania/hypomania, thought control, paranoia, strange experience, and hallucinations), no significant association was seen with psychosis for khat users. Also, they did not report khat-use alone; in addition to khat use, alcohol use and cigarette smoking; they reported polysubstance use (cannabis, inhalants, sleeping pills, heroin/morphine/pain medicine and a combination of cannabis, sleeping pills & hallucinogens) with khat use. Contrary, more recently in 2022, Edwards and Atkins [75] in their study reported that meta-analysis suggests that neither anxiety nor psychotic symptoms are associated with khat use. And subgroup analyses also found that the associations between khat use and psychotic symptoms/disorders are statistically insignificant. Other studies did not find a significant association between khat use and mental health disorders [21,89]. In recent cross sectional study, the association between khat use and mental disorders was not statistically significant [90], this is contrary to a review of khat use in different countries [12,99].

Warfa et al. [89] suggest that whilst khat-induced psychiatric problems are frequently reported in case studies, the balance of evidence suggests that khat alone does not directly cause mental disorders. Therefore, WHO [100] and ACMD [24,25] formulated recommendations to deal with khat related problems noted that high value readings are still infrequent.

In 2005 ACDM [24] report points out that as yet there are few controlled studies investigating the possibility of a causal link between khat use and psychosis and goes on to say that: "Evidence points to social stress, such as the effects of war on the Somali population mixed with the misuse of khat can increase the likelihood of the development of psychotic symptoms." As yet there is insufficient evidence to say whether khat is causing psychosis or exacerbating the symptoms in vulnerable individuals. The ACDM [24] states that available evidence suggests that khat use is not a causal factor for the development of psychosis. In 2013, ACMD [25] reported that the research on khat does not show a direct link between khat and psychosis. Some of the literature concludes that heavy or excessive khat use (usually daily use or binge use of more than two bundles in a session) can worsen existing mental health problems and/or complicate their treatment but that there is no clear evidence that khat use alone causes mental illness to develop in otherwise healthy people [6,24,25,89,99]. Some of the adverse outcomes are associated with khat use i.e. a complex interaction of khat with other factors to produce the outcome, but not directly caused by khat use [25]. Whilst there are numerous case studies, anecdotal and clinical reports of associations between khat use and psychosis the causal link between khat use and psychosis is often overstated [89]. In an extensive review of the Khat-induced psychiatric morbidity in the Netherlands, Pennings et al. [102]

conclude there is no strong, and even contradictory, evidence for a causal relation between khat use and psychiatric morbidity. The interesting in this review, "psychotic reactions to khat are rare and psychiatric institutions do not report a frequent admission of patients with khat related psychiatric disorders. Anderson et al. [101] similarly note the inadequacy of data that can establish a causal link between khat use and psychiatric disorders.

Finally, it is extremely difficult to establish or to attribute that khat use causes mental illness particularly psychosis and the insufficient evidence; it is overstated and the relationship between khat use and psychosis will remain unclear. Case reports and available cross sectional studies reporting khat-induced psychoses, all findings are contradictory and inconclusive [6,38,89,102].

In summary, some quantitative studies, case report studies or literature do not clarify the confusion on khat effects but attributed to khat chewing gives one the impression that cursed tree is the main cause of mental disorders [103] particularly psychosis, and most literature not realized social stress, traumatic events during war in Somalia, socioeconomically handicapped position and culturally isolated state (exile, immigrant) have contributed to the development of symptoms in several ways [6,21]. The quality of the available literature was considered to be generally poor so as to preclude meta-analysis [25]. Most of the studies suffer from different forms of biases [38]. The findings of case reports and other studies on association between khat use and psychosis should be read with caution [38,89].

## Conclusion

The sporadic case reports and qualitative studies are not just inconclusive but also contradictory. It is extremely difficult to establish or to attribute that khat use causes mental illness in particular psychosis; any association that is found may reflect an interaction with other environmental factors. The findings of case reports and other studies on association between khat use and psychosis must be interpreted with great caution.

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