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The impact of qat-chewing on health: a re-evaluation

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Introduction

The Qat plant (*catha edulis* Forssk) is a tree of the family Celastraceae that is widely cultivated in certain areas of East Africa and the Arabian Peninsula. The leaves of the qat plant contain alkaloids structurally related to amphetamine and they are currently chewed daily by a high proportion of the adult population in Yemen for the resulting pleasant mild stimulant action. The pleasurable central stimulant properties of qat are commonly believed to improve work capacity, are used on journeys and by students preparing for examinations and to counteract fatigue. In recent years as a result of air transport, the consumption of fresh qat leaves has expanded considerably and qat is readily and legally available in the UK.

Early clinical observations had suggested that qat has amphetamine-like properties, and subsequent chemical analysis confirmed that the fresh leaves contain alkaloids such as cathine and cathinone, the latter being structurally related and pharmacologically similar to amphetamine (1). Qat leaves also contain considerable amounts of tannins (7–14% in dried material), vitamins, minerals and flavonoids. Cathinone is currently believed to be the main active ingredient in fresh qat leaves.

Supporters of qat-chewing claim it is useful in diabetic patients since it is said to lower the blood glucose, acts as a remedy for asthma, and eases symptoms of intestinal tract disorders. Opponents claim that qat damages health and affects many aspects of life with adverse social, economic and medical consequences. In Yemen this has become a problem of grave national concern and we have reviewed the evidence for an adverse health impact.

Qat and the Central Nervous System

The effect that accounts for the popularity of qat is its central nervous system stimulation, believed to be induced by cathinone, an active ingredient of qat leaves. (1) Cathinone has a more rapid and intense action compared with cathine due to its higher lipid solubility which facilitates access into the central nervous system. Several studies showed that the psychostimulant effects induced by chewing qat include a moderate

degree of euphoria and mild excitement resulting in promotion of social interaction and loquacity. While attaining a subjective state of well being, the chewers feel an increase in alertness and energy together with enhanced depth of perception. These effects were found to be a maximum between 1.5 – 3.5 hours after starting to chew and they were progressively replaced by mild dysphoria, anxiety, reactive depression, insomnia and anorexia (loss of appetite). (2,3)

In recent years qat induced psychosis (serious mental illness) has become more common. This may follow consumption of exceptionally potent material, when taken in excess or in a predisposed individual. Psychotic features described in the literature include mania, paranoia and schizophrenia (4). Furthermore qat chewing seems to complicate the management of pre-existing serious mental illness. Preliminary data on sixty-five psychotic male patients who were admitted for psychiatric care in Sana'a because of symptoms uncontrolled by treatment have been analysed (5). They indicated that qat chewing in psychotic patients was likely to be associated with disturbance of mood and behaviour, aggravation of delusional symptoms and diminished response to anti-psychotic therapy. Previous similar studies have shown that failure to abstain from qat use might prolong a psychotic episode, even during treatment with psychiatric medication.

Tolerance to amphetamine occurs rapidly with increasing doses needed to achieve the desired psychic effect. In comparison with amphetamine, qat is much less likely to cause tolerance but some degree of tolerance has been observed in most chronic qat chewers to insomnia and anorexia.

The issue of dependence on qat has been reviewed by a World Health Organisation expert group on drug dependence who concluded that qat consumption may induce a persistent psychic dependence rather than physical dependence, albeit a certain degree of psychological dependence can occur. However, the psychological withdrawal symptoms after prolonged qat use seem to be limited to lethargy, mild depression, slight trembling and recurrent bad dreams. Lack of physical symptoms of withdrawal suggest that only rebound phenomena rather than a specific abstinence syndrome occurs. Therefore the World Health Organisation did not classify qat as an inevitably addictive drug.

Qat use is often accompanied by use of other substances. Simultaneous cigarette smoking is a common habit that might influence qat induced symptoms. Qat induced insomnia is frequent and qat users try to overcome this with sedatives or alcohol. A report from Ethiopia confirmed the simultaneous use of cigarettes, alcohol, gasoline inhalation and glue sniffing with qat among university students, a pattern similar to that reported for substance abuse in other countries.

Qat and the Cardiovascular System

The effects of qat on the cardiovascular system are a source of growing concern. Our recent work on Yemeni healthy adult volunteers provided evidence that qat chewing produced a significant rise in arterial systolic and diastolic blood pressure and pulse rate. The peak effect on the arterial blood pressure and pulse rate was reached three hours after starting to chew, followed by a decline one hour after spitting out the leaves. These changes run parallel with the changes in plasma cathinone levels during and after qat chewing (6). Similar blood pressure changes have also been observed in smaller numbers of subjects when pure cathinone in gelatine capsule was taken orally. These observations support the suggestion that cathinone is the constituent that is mainly responsible for the increasing arterial blood pressure and pulse rate parameters

during qat chewing. The likely mechanism is the release of catecholamines (such as noradrenaline) from presynaptic storage sites mimicking stimulation of the sympathetic nervous system (sympathomimetic). To gain further insight into the pharmacological effects of qat chewing we conducted a randomised controlled clinical trial of alpha-1 and selective beta-1 adrenoceptor blockade on adult Yemeni volunteers (7). Results indicated that selective beta-1 adrenoceptor blockade with atenolol prevented the elevation of systolic blood pressure and increase in pulse rate. It could be anticipated, therefore, that qat chewing carries a potential cardiovascular risk especially in patients with hypertension and heart disease, and might precipitate the occurrence of cerebrovascular accidents (stroke) and myocardial infarction (heart attack) in susceptible individuals.

The effect of qat chewing on blood pressure and cardiac rhythm among Yemeni patients with hypertension and ischaemic heart disease was explored using 24 hour ECG Holter monitoring and ambulatory blood pressure monitoring. The study showed the expected progressive increase in blood pressure and heart rate and abnormalities developed on the ECG in 20% of patients with ischaemic heart disease. The likely role of qat chewing as a risk factor for acute myocardial infarction in Yemen was investigated recently in a clinical study in Sana'a (8). It is well established that under normal circumstances the most likely time of day for a heart attack to develop is the early hours of the morning and this circadian rhythm is disturbed in qat chewers in whom, by contrast, the peak period of presentation of acute myocardial infarction was during the afternoon, commencing at 1500 (soon after qat chewing commenced) continuing until 2100 hours and then declining towards a trough at 0300 hours.

Qat and the Digestive System

Qat chewers often complain of symptoms suggestive of inflammation of the mouth (stomatitis), oesophagitis and gastritis. These effects were believed to be caused mainly by the strongly astringent tannins in qat.

Recent evidence has shown that qat-chewing delays gastric emptying of a semi-solid meal, probably as a result of the sympathomimetic action of cathinone in qat (9). Delayed gastric emptying may contribute to an increased rate of gastro-oesophageal reflux manifested as heartburn and acid regurgitation, and to an increased risk of Barrett's oesophagus, a pre-cancerous condition (see 'Qat and Cancer' below). Anorexia (loss of appetite) frequently follows a qat session, and chewers seldom eat a further significant meal the same day. This anorectic factor may be attributed to combined direct central and gastric effects of cathinone in fresh qat leaves (9).

A common complaint of qat chewers is constipation, probably caused by a combination of the astringent properties of the qat tannins and the sympathomimetic properties of cathinone (1). Habitual users try to attenuate this undesirable effect by food adaptation, notably eating prior to the qat session with a meal of high fat content in order to facilitate intestinal transit. The constipating effect of qat was suggested by the observation that when a ban was imposed on qat in Aden in 1957, the sales of laxatives decreased by 90% but returned to the original level soon after the ban was lifted. Recent evidence has shown that chewing qat leaves significantly slows both the oro-caecal transit time and the whole gut transit time (10). These two mechanisms may contribute to the constipating effect of qat. Moreover, qat chewing was found to interfere with the absorption of some orally administered antibiotics, particularly ampicillin and tetracycline resulting in low bioavailability. Qat chewing has no effect on gallbladder contraction.

The liver was suspected by many authors to be particularly vulnerable to the harmful effects of qat use, and a disturbance in liver function and architecture has been described in experimental animals both on short term and long term feeding with *Catha edulis* leaves. In a recent study on acute sporadic hepatitis with jaundice in adults in Yemen, it was found that hepatitis viruses types A to E accounted for only 41% of cases and in 51% of cases no viral cause was identified. There may be an unknown virus responsible or some environmental toxins such as pesticides in qat leaves (11). Certainly patients are described with liver function test abnormalities which resolves when qat chewing is suspended.

Qat and the Genito-urinary System

One of the obvious side effects of chewing qat leaves in males is temporary interference with micturition with hesitancy and poor flow. The overall urine flow rates were recently found to be significantly lower in qat users. This effect is probably mediated through stimulation of alpha 1 adrenoceptors in the bladder neck by the sympathomimetic alkaloid cathinone. These effects were abolished by the alpha 1 adrenoceptor blocker indoramine (12). The consumption of qat is also said to induce an increase in libido, spermatorrhoea and erectile dysfunction but this has not been adequately studied.

In the domain of reproductive medicine, epidemiological data derived from 1181 deliveries in Yemen showed that at birth the mean weight of full term single infants from mothers who chewed qat habitually or occasionally, was below average (13), and recent evidence indicates that neonates of mothers who chewed qat in pregnancy had a significant decrease in all neonatal parameters such as birth weight, length, head circumference in comparison with those mothers who were not qat-chewers during pregnancy. The effect was found to increase in severity with increased frequency and duration of qat-chewing in pregnancy.

Nursing mothers in Yemen frequently complain of poor lactation.

Qat and Diabetes mellitus

The effect of qat chewing in diabetic patients is unclear. Some authors believe that the overall effect of qat in diabetic patients is deleterious, because the user is less likely to follow dietary advice, and the consumption of sweetened beverages with qat raises blood sugar. However, one study showed that when qat extract was mixed with the glucose given for the glucose tolerance test, there was a significant lowering of blood glucose level in comparison to the non-qat (control) arm of the experiment. This effect was attributed to delayed glucose absorption from the intestine by the action of qat tannins and inorganic ions. But the qat-induced delay of gastric emptying (9) may also play a role in reducing the blood sugar after eating.

Qat and Cancer

Since qat use is widespread and often persists throughout adult life, a number of studies have been made on the toxicological aspect of habitual qat use.

Owing to its mode of consumption, qat frequently affects the oral cavity and digestive tract. Tumours of the oral cavity (lower maxilla, buccal mucosa and lateral surface of the tongue) were reported in 13% of patients seeking treatment over a two year period in a clinic in the Yemeni town Hodeidah. Most of them had been habitual qat chewers for more than 20 years, and some of them also chewed shamma (ground tobacco). A

similar review of mouth cancers presenting over a two-year period in the Asir region of Saudi Arabia showed strong circumstantial evidence linking the long term use of qat with an increased rate of oral malignancies.

Tannins in qat can thicken the mucosa of the oropharynx and oesophagus, and may be carcinogenic. A recent study in Yemen has shown that oesophageal and gastric carcinoma accounted for as much as 6% of all patients who had an upper gastrointestinal endoscopy (183 out of 3064 patients) over a period of one year (14). A preponderance of women with carcinoma of the mid-oesophagus was noted, previously only recorded in areas of high prevalence of oesophageal carcinoma. A high frequency of qat-chewing and water-pipe smoking was found for both men and women to be linked with a group of tumours of the gastro-oesophageal junction or cardia. This apparent association with carcinoma of the lower oesophagus might be related to the qat-induced delay of gastric emptying with a subsequent increased risk of gastro-oesophageal reflux and Barrett's oesophagus (9). The effect of chewing qat on the mucosal histology of the upper gastrointestinal tract was explored in Yemeni patients complaining of dyspepsia. Regular daily qat chewing was not associated with any major effect on the oesophagus or stomach but duodenal ulcers were commoner in chewers. This may have been associated with the high prevalence of smoking in this group. Gastric type mucosa at the lower end of the oesophagus is thought to increase the risk of developing adenocarcinoma by 30–125 fold. Although its presence was not related to the intake of qat, its overall prevalence in Yemeni patients was comparatively high (18%). To clarify this point, a case control study on oesophageal carcinoma in Yemen is planned.

Qat and Oral-dental tissue

The association with mouth cancer has been discussed above.

Adverse effects of qat chewing on oral-dental tissues were first observed 50 years ago with inflammatory change (stomatitis) followed by secondary infection. These might be related to mechanical strain on the cheek and other oral tissues as well as chemical irritation of the mucosal surfaces. A high rate of periodontal diseases and low rate of dental caries has been observed among Yemeni male qat chewers. Mouth dryness, common following qat chewing, might be due to the sympathomimetic effect of Cathinone and/or to excess secretion of saliva during chewing.

Recently a cross sectional hospital study based among Yemeni qat and non-qat chewers has confirmed that qat chewing caused many lesions to the supporting structures of the teeth, namely gingivitis, periodontal pocket formation, gingival recession, tooth mobility and tooth mortality. Qat chewing caused clicking and pain in the temporomandibular joints and led to attrition and staining of teeth and cervical caries particularly among crystallized sugar consumers.

Qat chewing results in mouth dryness, enlargement of salivary glands, inflammation and folding of the parotid papilla at the site of qat chewing. Qat chewing also caused obvious facial asymmetry.

Conclusions

The habit of chewing qat leaves (*Catha edulis*) is widespread in certain areas of East Africa and the Arabian Peninsula. It has pleasurable central stimulant properties, which are commonly believed to improve work capacity and counteract fatigue. The consumption of qat causes acute effects on the central nervous system leading to

exacerbation of symptoms in psychiatric patients, on the cardiovascular system leading to hypertension and increased risk of cardiovascular events particularly in hypertensive patients and on the male urinary bladder neck leading to weak stream of micturition. The effects on other parts of the body such as the mouth, oesophagus and gastrointestinal tract as well as foetal development seem to be related to chronic intake. There is concern about hazards related to the pesticides used in qat cultivation.

Recommendations

- To increase public awareness of the potential health hazards of qat chewing.
- To support scientific research on qat in different institutions and universities and to explore the different effects of qat on public health.
- To integrate education about qat into the curricula of the primary and secondary schools.
- To legislate on the use of pesticides in the cultivation of qat in view of their potentially harmful effects on human health.

References

- 1 Kalix P. Pharmacological properties of the stimulant khat. *Pharmacol Ther* 1990; 48: 397–416
- 2 Hassan NAGM, Gunaid AA, El Khally FMY, Murray-Lyon IM. The effect of Khat chewing leaves on the Human mood. *Saudi Med J* 2002; 23(7): 850–853
- 3 Hassan NAGM, Gunaid AA, El Khally FMY, Murray-Lyon IM. The subjective effects of chewing qat leaves in human volunteers. *Annals of Saudi Medicine* 2003; 22 (1–2): 34–37
- 4 Pantelis C, Hindler CG, Taylor JC. Use and abuse of khat (*catha edulis*): a review of the distribution, pharmacology, side effects and a description of psychosis attributed to khat chewing. *Psychol Med* 1989; 19: 657–668
- 5 Hassan NAGM, Gunaid AA, Ali MS, Shehab MMI. The effects of chewing qat leaves on psychotic patients. *The Journal of The Egyptian Society of Pharmacology & Experimental Therapeutics* 2003; 23 (1): 179–190.
- 6 Halket JM, Karusu Z, Murray-Lyon IM. Plasma cathinone levels following chewing khat leaves (*Catha edulis* Forsk). *J Ethnopharmacol* 1995; 46: 111–113.
- 7 Hassan NAGM, Gunaid AA, El Khally FMY, Al-Noami MY, Murray-Lyon IM. Qat chewing and Arterial Blood pressure. A Randomised Controlled Clinical Trial of Selective alpha-1 and beta-1 Adrenoceptor Blockades. *Saudi Med J* 2005; 26: 537–541.
- 8 Al-Motarreb AL , Al-Kebsi M, Al-Adhi B, Broadley KJ. Khat chewing and acute myocardial infarction. *Heart* 2002; 87: 279–280.
- 9 Heymann TD, Bhupulan A, Zuriekat NEK, Bomanji J, Drinkwater C, Giles P, Murray-Lyon IM. Khat chewing delays gastric emptying of a semi-solid meal. *Aliment*

Pharmacol Ther 1995; 9: 81–83.

10 Gunaid AA, El Khally FMY, Hassan NAGM, Murray-Lyon IM. Chewing qat leaves slows the whole gut transit time. Saudi Med J 1999; 20: 444–447.

11 Gunaid AA, Nasher TM, El-Guneid AM, Hill M, Drayton R, Pal A, Skidmore SJ, Coleman JC, Murray-Lyon IM. Acute Sporadic Hepatitis in the Republic of Yemen . Journal of Medical virology 1997; 51: 64–66

12 Nasher AA, Qirbi AA, Ghafoor MA, Catterall A, Thompson A, Ramsay JWA, Murray-Lyon IM. Khat chewing and neck bladder dysfunction. A randomised controlled trial of a1 adrenergic blockade. Br J Urol 1995; 75: 597–598.

13 Abdul-Ghani NA, Eriksson M, Kristiansson B, Qirbi AA. The influence of khat chewing on birth weight in full term infants. Soc Sci Med 1987; 24: 625–627

14 Gunaid AA, Sumairi AA, Shidrawi RG, Al-Hanaki A, Al-Haimi M, Al-Absi S, Al-Huribi MA, Qirbi AA, Al-Awlagi S, El-Guneid AM, Shousha S, Murray-Lyon IM. Oesophageal and gastric carcinoma in the Republic of Yemen . British Journal of Cancer 1995; 71: 409–410

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