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KHAT HABIT AND ITS HEALTH EFFECT. A NATURAL AMPHETAMINE

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Chewing the leaves of the khat shrub is common in certain countries of East Africa and Arabian Peninsula mainly Yemen. It has been established that a khat plant leaves contain an active psycho-stimulant substance known as cathinone that is similar in structure and pharmacological activity to amphetamine in affecting the CNS. Intoxication with khat is self-limiting but chronic consumption can cause certain health disturbances in the user and also lead to social and economic damage to the individual and the community. In recent years, several cases of intoxication have been observed outside the area of its use.

In this view, the khat habit, its health effects and socioeconomic aspects are described with the political issue they imply.

INTRODUCTION

During the preparation of my thesis for post-graduation in the Czech Republic, I had to mention to some extend khat (qat), as an explanation of the country profile of Yemen, is not complete without mentioning it. Khat (*Catha edulis* Forsk) is the silent feature of the social life in Yemen. Going through the literature I was somewhat surprise as a physician and as a person living in this society, surrounded by this habit.

HISTORY

Historically, the original source of khat seems to be obscure. However, there is general agreement that its use was prevalent in Ethiopia and from there, around the fifteenth century, the practice spread to the south-west of the Arabian Peninsula[1, 2]. Arab sources suggested that khat was in Yemen in the sixth century, when the Ethiopians conquered Yemen. Earliest reference to this plant appears to be dated around 973–1053 AD. by Al-Biurni, who meticulously compiled information on all contemporary drugs, what he called qat that was imported from Turkistan. It was used to relieve biliousness and to cool the stomach and liver[3]. Haecock and Forrest[4, 5] mentioned (1974) that, it is possible to find a referral to khat as early as 1332 AD in an Arabic manuscript preserved in the Biblioteque National in Paris. The first account of its effects appeared more than seven centuries ago in an Arabic medical textbook[6] in which the leaves of it were recommended for curing depression. The earliest scientific report on khat presented to a Western country was in the eighteenth century, when the botanist, Peter Forskal, identified the plant in Yemen and called it *Catha edulis*. However, he did not live long enough to publish his finding, which were later edited in 1775 by Niebuhr[7], the only survivor of the first European scientific expedition to Arabia. Niebuhr, in his general observation, stated that he "never saw the Arabians use opium like the Turks and Persians. Instead of taking this gratification, they chew kaad (khat). These are the buds of a certain tree, which are brought in small boxes from the hills of Yemen"[8].

In memory of his friend, Niebuhr labeled khat under the generic name of *Catha edulis* Forsk. Other names were given to the plant by various travelers visiting Arabia and East Africa in the nineteenth century.

ILLEGALITY

Mainly people around the Red Sea, including parts of Ethiopia, Kenya, Somalia, Zimbabwe, Tanzania, Uganda, Malawi and South Africa[9] as well as Yemen use khat. However nowhere else it is as widespread as it is in Yemen[10].

In Islamic countries like Yemen Republic and Somalia, as among the Muslim members of Ethiopia and Kenya khat is the drug of choice and is legal, for unlike alcohol, it's use violates no precise proscription of the Koran.

Khat is banned on religious grounds and economic grounds in some other Muslim countries as in Saudi Arabia[11, 12]. In some other countries the penalties are equivalent to those for opium or cannabis for anyone that carries or uses it. This is not so in Yemen, where even religious leaders practice this habit. This may be because, in con-

trast to opium and cannabis, it produces milder antisocial behavior, and is more akin to amphetamine- or caffeine-type substance[13]. In Ethiopia and neighboring countries it is commonly used in social gatherings as much as alcohol is used in western countries.

With regard to European countries, it would seem that there is relatively little that they have to fear from khat, not only because of the unattractive mode of consumption of the drug, but also because it is cumbersome and of low potency when compared to its pharmacological analog amphetamine. Nevertheless, the possibility of preventive scheduling should be considered before an increase of the habit, particularly in immigrant circles, witch may lead to problems. At this point, khat trade and use is not illegal in the U.K., and it is known that there is a market and a distribution network for the drug, and that in certain locations the use of this plant is substantial. It must also be kept in mind that an attempt to cultivate it in a country of moderate climate for personal use has been reported in the literature[14]. I know many European people in Yemen who liked the habit of chewing khat and are already used to it, when they leave the country they get a supply of it from time to time. The position of the European countries with regard to khat is not uniform[15]. It is prohibited in France, Switzerland and Sweden while it is tolerated in the U.K. and in the Netherlands. Outside Europe, it is legal in the U.S.A. and in Australia[16] indeed, the case of this plant is an equivocal one and the international law on this issue is currently ambiguous.

HABIT

Whatever may be the reasons for the use of khat, its pleasure-inducing and stimulating effects seem to have a strong influence on the social and cultural life of the communities who indulge in it. Afternoon khat session in Yemen takes place between 2:00 and 7:00 nowadays it may be continued to late in the evening according to the purpose, studying, working, writing poetry or only enjoying time. These sessions is held in special rooms (muffraj or diwan) designated for this use. These rooms are furnished with comfortable cushions around the walls, and Persian or Bedouin rugs on the floor, upon which sit low tables with shining brass trays and several large communal tobacco pipes or "Hubbell-bubbles" called madah in the center. Smoking tobacco and cigarettes and drinking cola, weak black tea or just cold water greatly enhance the pleasure of chewing. Some have the habit of using sugared menthol or pieces of sugar or even cardamon to improve the bitter test of khat. It is predominantly consumed in a social setting. The habit in Yemen is socially sanctioned and even prestigious, such sessions are a form of social interaction and status competition. They are governed by subtle rules while being under certain circumstances, of almost ritual importance. It has been suggested that the function of khat in this context is to provide a pretext for a gathering of high social significance rather than to provide pleasurable effects for the individual. Indeed, because of its stimulating and euphorigenic properties, khat is certainly an appropriate tool for enhancing social interaction. In countries other than Yemen it is consumed in a much less rigidly defined context, frequently by individuals, who are alone. Therefore, it can be assumed that in those countries the psychosocial benefits of its consumption are of secondary importance and that rather it is the pharmacological action that induces the use of this plant. This is also borne out by the fact that khat use tends to be compulsive in certain individuals and the cost of the euphorigenic effect of the leaf is addiction[17].

The young shoots of the khat shrub are harvested in the early hours of the day and sold in markets by the late morning. A khat chewier consumes about 100–200 g of the leaves per person. The leaves are taken one by one from the twigs and thoroughly chewed. They are then kept for some time in the cheek as a ball of macerated material and later spit out. The young leaves, which come from the tips of the branches, are preferred since these are the most potent. Male and female users congregate separately; for male users in particular; the khat session has an important social function since it provides a forum for discussing matters of general interest such as community affairs. The chewier describe the drug as having a number of beneficial effects such as improving their ability to communicate, to generate new ideas and to suppress the feeling of fatigue. The social environment appears to influence the response of the chewier and the effect is more readily perceived by the habitual user[12]. Women khat sessions were less common until some years ago when the habit of khat chewing increased rapidly causing serious problems for the family and the socioeconomic situation[18, 19].

Khat is deeply rooted in the sociocultural traditions of several countries, where it was practiced by a limited segment of the population in a well-defined and stable social setting. In recent years, however, the use of this stimulant has expanded beyond these boundaries and has now reached epidemic proportions. This phenomenon can be explained not only by the advent of modern transportation, but also by profound social and cultural changes that has taken place in these countries in the twentieth century.

COMPOSITION

Cathinon and cathine:

There are more than 40 alkaloids, glycosides, tannis and terpenoids in khat in addition to the two phenylalkaminens cathine (norpseudoephedrine) and cathinone{S(-)-alpha-aminopropiaphenone)}that have amphetamine like effect[20].

The chemical constitute of khat have been studied since the late 19th century. Fluckiger and Gerok were among the first who found an alkaloidal fraction in this plants[21] and called it "katin". This was followed by the isolation of many other substances and it was not until the year 1975 that the most important component of khat was isolated and named cathinone {S (-)-alpha-aminopro-

piaphenone)} at the United Nations Laboratories and it is considered the principle stimulant of the central nervous system (CNS)[22]. Determining the total contents of cathine and cathinone in fresh khat follows. It was found to range from 78–343 mg/100 g fresh khat from different khat samples[23, 24].

Tannin concentration ranges from 9.7 g/100 g of khat leaves as maximum to 3.5 g/100 g as minimum in different types of Yemeni khat. The amino acids: asparaginic acid, thyreonine, serine, glutamine, proline, glycine, alanine, valine, isoleucine, phenylalanine, tyrosine, a-aminobutric acid, histidine, tryptophan, ornithine, arginine and choline were also found to a different concentrations[25, 26]. Vitamins and minerals as ascorbic acid and magnesium in a concentration of about 130–160 mg/100 g[27] and 6–41 mg/100 g[24] were also found.

HEALTH EFFECT

Khat has a psychological, medical, social and economic effects on human beings.

Cathinone is structurally and functionally closely similar to amphetamine and releases catecholamaines from pre-synaptic storage sites resulting in CNS stimulation and a variety of peripheral sympathomimetic effects such as tachycardia and hypertension. It has been reported that the effects of a portion of khat are very similar to those of about 5-mg amphetamine[28].

Habitual users report increased levels of energy, alertness and self-esteem, sensations of elation, enhanced imaginative ability and capacity to associate ideas. An improvement in the ability to communicate is also reported, which explains the tendency to group interaction and social contact while under the effect of the drug. Some khat users take the drug because it helps them to work either by allowing them to concentrate better or providing additional energy for physical labor. Experienced users better perceive its effect. A common effect of khat use is insomnia, a condition that the users sometimes try to overcome with sedatives or alcohol. Furthermore, it has a pronounced anorectic effect. In clinical terms, khat can be said to induce a state of mild euphoria and excitement, often accompanied by loquacity or even logorrhea. In some cases it can progress to a stage of hypomania. Toxic psychosis may also result from its consumption, and a number of such cases have been described in the literature[29, 30]. The psychotoxicity of khat complicates surgical anesthesia and is particularly evident in the postanaesthetic phase, during which these patients may behave aggressive[31]. A group of expert in WHO has concluded that khat consumption may induce "moderate but often persistent psychic dependence" the withdrawal symptoms after prolonged khat use seem to be limited, however, to lethargy, mild depression, slight trembling and recurrent bad dreams[32].

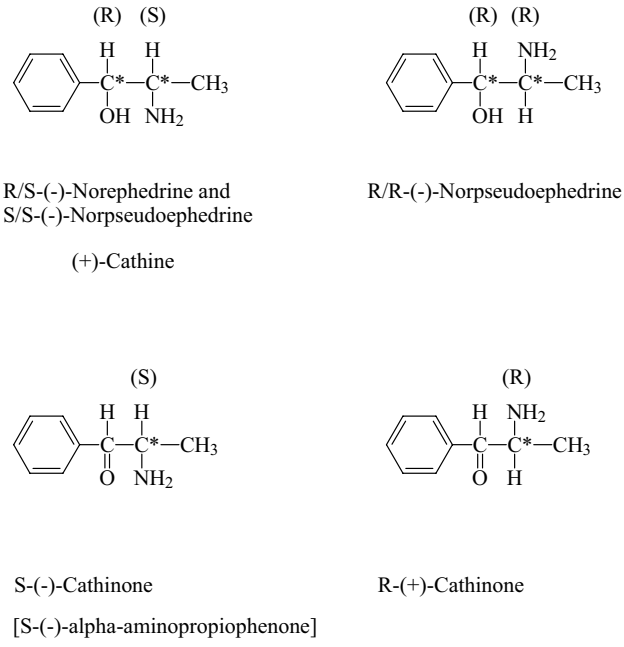

Fig. 1. Chemical structure of cathinone and cathine

CNS tolerance is not usual in khat users probably due to the physical limits on the amount that can be chewed. Mydriasis occurs as a sympathomimetic effect of khat, which also induce hyperthermia and causes dryness of the mouth.

At the cardiovascular level there may be arrhythmia's and moderate increase in blood pressure which can become chronic upon long term use[32]. There is exaggerated cardiovascular response to physical effort under the effect of khat[33]; it can also cause acute cardiovascular problems particularly in elderly people[34]. It is found that certain degree of tolerance develops to these sympathomimetic effects[35]. Khat stimulates the respiratory center and bronchodilation, which can explain the feeling of comfort for asthmatic users.

Khat affects the urinary system by relaxation of bladder wall and closure of internal sphincter. Urine retention may also occur and maximum urine flow rate is reduced[36].

The digestive tract is mainly affected by the presence of tannins in this plant. Gastritis and constipation are some of the main complains of its users, loss of appetite is also a characteristic of khat. The malnutrition and constipation are attributed to both tannins and norpesudoephedrine. Khat is may be a factor in the development of periodontal and the brownish coloration of the teeth. Toxicity has been evaluated in laboratory animals, and khat extracts have been reported to contain mutagenic factors[37–39]. A strong correlation between khat chewing and oral cancer has been reported which could also be related to the insecticides used for the plant[32]. Due to the mode of consumption of khat by humans, however, any extrapolation of such data is difficult.

Khat consumption is also known to cause spermatorrhea and chronic use may lead to spermatozoa and in the later stage to impotence[32], this effect in a recent study on rabbits was found to be to a large extend a dose related[40].

Cathinone contents in this plant may be partially or totally responsible for the reproductive toxicity in human and in experimental animals[41]. This effect appears to be a decrease in semen output; sperm count, motility and an increase in the number of abnormal sperms. It has been found that khat decrease fertility through this mechanism, which is reversible by withdrawal of its usage.

Khat affects pregnant women by reducing maternal daily food intake and mean birth weight of the offspring[39, 42, 43]. Low birth weight is a contributing risk factor for both prenatal and infant mortality among khat chewers during pregnancy. It can affect fetal growth during pregnancy through placental insufficiency, which could be explained by the high blood pressure registered among these women. In many experiments visceral and skeletal malformations have been reported but have not been proved yet in humans.

Varied and complex factors underlie the use of khat. It is commonly used for social recreation and occasionally as a medicine. Because of its stimulating effects it has been traditionally used as a medicine. By some tribal people when traveling, and in modern times by students for examinations, drivers of motor vehicles especially on long-distance journeys and even soldiers during the war were given khat in order to enhance their performance. The pattern, therefore, of why, how, when, and where khat is used depends on different social and ecological factors.

From the economical point of view khat also diverts household income that could have been wisely used for nutritious food, home improvements, education or other family needs that people on those countries are in very big need for.

Khat needs less water than sorghum and coffee. It is usually planted in terraced or on the sunny sides of the steep slopes. It has mostly replaced the famous Yemeni coffee and seriously damaged the coffee economy[11]. The demand for and the price of the khat plant vary with the soil and climate in which it grows[13].

Finally, despite all the negative aspects of khat chewing the habit is unlikely to change significantly in the coming years and is in fact increasing directly in Yemen.

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