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ORIGINAL ARTICLE

Decreased antioxidants in the saliva of Khat chewers

Anwar Masoud *, **Abdullah Al-Qaisy, Afaf Al-Faqeeh, Asmaa Al-Makhadri, Dhoha Al-Awsh, Haitham Al-Madhagi, Mohammed Qrabish, Raoof Muharram, Yusuf Mujalli, Zainab Al-Hebsi**

Division of Biochemistry, Chemistry Department, Thamar University, Thamar, Yemen

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KEYWORDS

Amphetamine;
Antioxidant;
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Abstract *Objective:* Khat is a plant of the *Celastraceae* family that is chewed for several hours/-day in Yemen and most of the East African countries. Cathinone and cathine are the main Khat components and are structurally and functionally related to amphetamine. The present study has been designed to assess levels of antioxidants in the saliva of Khat chewers.
Methods: Saliva samples of 50 volunteers were collected from Khat-chewers and non Khat-chewers, 25 samples each. Saliva samples were collected and used for measurments of salivary antioxidant system including; catalase, total and protein thiols, glutathione and uric acid (UA). Moreover, activity of α-amylase and lactate dehydrogenase (LDH) and levels of total protein, glucose, and cholesterol were also measured.

Abbreviations: CAT, catalase; GSH, reduced glutathione; P-SH, protein thiol; ROS, reactive oxygen species; Total-SH, total thiols; UA, uric acid

* Corresponding author at: Department of Chemistry, Faculty of Applied Science, Thamar University, P.O. Box 87246, Thamar, Yemen. Tel.: +967 735805888.
E-mail address: angaz76@gmail.com (A. Masoud).

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Results: The activities and levels of antioxidants were significantly decreased in Khat-chewing group as compared to controls ($p < 0.001$), except the level of UA which was significantly increased. Khat has also been found to have a lowering effect on the activity of salivary amylase and glucose level ($p < 0.001$). However, the levels of salivary LDH, total protein, and cholesterol were significantly increased in the saliva of Khat chewers ($p < 0.001$).
Conclusion: Present data suggest that Khat chewing generates free radicals and reactive oxygen species to a level that antioxidants cannot cope with, thus overwhelming the antioxidant system capacity.

1. Introduction

People in Yemen and East African countries spend between 4–6 h a day in chewing the leaves of the Khat (*Catha edulis*) plant, however, this habit spread to some other countries where Yemeni and other East African communities are living.[1,2] General health and socioeconomic impacts have been reported due to Khat chewing in Yemen.[3] The common adverse effects of Khat use which include insomnia, anorexia, hyperthermia, mydriasis and endocrinological disturbances are due to the release of the psychoactive agents such as cathinone.[4,5] Minor antioxidant components have been found in the plant which cannot overwhelm the effects of free radicals and oxidants implicated in Khat toxicity,[6] although the decreased activity of antioxidant enzymes due to reactive oxygen species (ROS) and oxidative stress has been reported in rats[6] and humans[7–9] following Khat chewing. Antioxidants represent one of the defense mechanisms against oxidative stress which are present in all body fluids and tissues including the saliva.[10] Recently, the relationship between Khat and free radicals has been reviewed.[11] The present study has been designed to assess the levels of antioxidants in the saliva of male Khat chewers of the Thamar city, Yemen.

2. Materials and methods

2.1. Chemicals

Ellman reagent (DTNB) was purchased from HiMedia, India. Kits of the biochemical tests were purchased from Spinreact, Spain. All other chemicals used were of highest grade commercial products.

2.2. Study design, population and grouping

Fifty healthy individuals aged 20–30 years selected from the Thamar city were divided into two groups with $n = 25$ individuals each:

1. *Non-Khat chewers (control) group:* local males never chew Khat.
2. *Khat chewers group:* local males with the habit of chewing Khat.

Those included in the present study fulfill the following criteria: healthy, non diabetic and sex and aged match volunteers and those excluded are suffering from periodontitis, carcinoma and diabetes. The study was performed in accordance with the Helsinki Declarations and approved by the Ethics Committee, Thamar University, Yemen.

2.3. Sample collection

Saliva samples of 50 individuals (25 each group) were collected between 8–10 AM on fasting and 12 h after the Khat chewing session. The samples were centrifuged immediately; the supernatant of each sample was used for biochemical analyses.

2.4. Biochemical assays

2.4.1. Total thiols (Total-SH)

Total thiol groups were quantified in the saliva according to the method of Ellman[12] as modified by Sedlak and Lindsay[13] and described by Masoud et al..[8]

2.4.2. Low molecular weight thiols

Low molecular weight thiols, LMW-SH [primarily GSH] were measured in the saliva according to the method of Ellman[12] and described by Masoud et al..[8]

2.4.3. Catalase [CAT] activity

CAT activity was assayed in the saliva following the method of Luck[14] and described by Masoud et al..[8]

2.4.4. Cholesterol, total protein, glucose and uric acid [UA] level

Cholesterol, total protein, glucose and UA levels were measured in the salivary supernatant according to the protocol provided by commercial kits, Spinreact, Spain (CV% ranges between 0.21–0.71). Results were expressed as mg/dl.

2.4.5. Lactate dehydrogenase [LDH] and amylase activities assay

LDH and amylase activities were measured in the salivary supernatant according to the protocol provided by commercial kit, Spinreact, Spain (CV% 1.13 and 1.64 for LDH and amylase respectively). Results were expressed as U/dl.

2.4.6. Statistical analysis

Data were expressed as mean ± S.D. and were analyzed by student's *t*-test. Differences between groups were considered significant when $p < 0.001$. All analyses were performed using the sigma-stat software [version 3.5].