

What can research evidence tell us about effect of khat on health and socio-economy? Rapid evidence review

Sabit Ababor Ababulgu*, Zelalem Kebede, Tsegaye Getachew, Firmaye Bogale, Dagmawit Solomon, Samson Mideksa, Ashenif Tadele, Arega Zeru, Ermias Woldie, Desalegn ararso, Tesfaye Dagne and Yosef Gebreyohannes

Ethiopian Public Health Institute, Addis Ababa, Ethiopia

*Corresponding author: sabitababor32@gmail.com

Cell phone: +251-9111988638

Key findings

Khat chewing was highly associated with elevated Blood pressure (BP) and heart rate which are established risk factors for cardiovascular diseases. Khat induces a very consistent and reproducible type of cell death in humans but evidence has not been found on the direct relationship between Khat and cancer. Sub-chronic exposure to khat affects short-term memory depending on the duration of exposure. However, it does not have any effect on long-term memory. But, it induces neurobehavioral changes.

There are high socioeconomic implications of Khat chewing including big money spending on buying Khat, getting forced into credit and money borrowing. The social burden of Khat chewing goes beyond the Khat chewers affecting women, children, families and communities at large.

Even though the qualities of evidence included in this review range from inconclusive, low and medium; it can be considered that Khat chewing results in varieties of health consequences. Therefore, this review is thought to be sufficient to regulate Khat from its production to consumption. The social and economic effects of khat consumption on individuals and households need further research.

How this Rapid Evidence Review was prepared? The rapid evidence review approach (adapted from Supporting the Use of Research Evidence/SURE guide for Rapid Response Services) was applied to search, appraise and summarize the best available evidence on the effect of khat on health and socio-economy. We identified the PICO concerning the objective of the review to facilitate the searching of relevant articles.

To answer the review question, we searched for high-quality studies (systematic reviews & RCT) from SUPPORT Summaries, Health Systems Evidence, Epistemonikos, PDQ-Evidence, the Cochrane Library, and PubMed. The search was made with no date or language restrictions. The last search was made on January 11, 2021.

What is a Rapid evidence Review? Rapid evidence review addresses the needs of policymakers and program managers for research evidence that has been appraised and contextualized to a specific context in a matter of hours or days. This rapid evidence review goes beyond research evidence and integrates multiple types and levels of evidence.

Where did this Rapid Evidence Review come from? This document was developed in response to the request from Khat Research Advisory Task Force established to look for research evidence to advise the khat regulation, drafting team. It was prepared by the Knowledge Translation Directorate and Health System Research Directorate, Ethiopian Public Health Institute.



Included:

- Key findings from research findings



Not included:

- Recommendations

Introduction

Khat is a shrub (*Catha edulis*) of the family Celastraceae that is cultivated in the Middle East and Africa for its leaves and buds which are the source of a habituating stimulant when chewed or used as a tea (Kalix 1992a). According to Kalix (1992b), cathinone is an alkaloid that has been discovered from the leaves of khat. Cathinone was soon found to have a pharmacological profile closely resembling that of amphetamine (Kalix). An estimated 20 million people worldwide use khat regularly as a stimulant (El-Menyar et al. 2015). Various literature reviews indicate that khat grows in East Africa and the Southern Arabian Peninsula. The inhabitants of these regions frequently chew khat. Historical references to the chewing of khat

leaves are for their euphoric and stimulant effect which dates back many centuries and today this practice is prevalent in Somalia, Yemen, Kenya and Ethiopia (Capriola 2013; Kalix 1992b; WHO 1980). Khat is known by a variety of names, including: Abyssinian tea, African salad, bushman's tea, catha, chat, flower of paradise, gat, herari, jaad, kaad, leaf of Allah, mirra, qaat, qat, and tea of the Arabs among others. The earliest scientific report on khat was written in the 18th century by the botanist Peter Forskal. Many believe that khat originated in Ethiopia, from where it spread to the hillsides of East Africa and Yemen; others argue that it originated in Yemen before spreading to Ethiopia and nearby countries (Lamina 2010).

Burden of khat-chewing in Ethiopia: Khat is native to the Eastern and Southern regions of Africa but is grown extensively as a cash crop in Ethiopia, where it is freely available and is a highly valued export commodity (El-Menyar et al. 2015; Lamina 2010). As per the 2019/20 report from the National Bank of Ethiopia, Khat is the third in its export share with 10.9% following coffee and flower recording a share of 28.6% and 14.1% respectively (NBE 2020). Though there are no concrete data on how many people consume khat in Ethiopia, the national NCD STEPS survey which was done in 2015 indicated that about 15.8% were khat users, of which, 21.1.% of men and 9.4 % of women (EPHI 2015). In recognition of the khat chewing burden, the Ministry of Health of Ethiopia established the national task force to advise the khat regulating legislation drafting team through generating synthesized evidence on the effect of khat on health. Accordingly, the team at the Knowledge Translation Directorate, EPHI, conducted this rapid evidence review to inform policy decision-makers on the area.

Objectives of the review

The objective of this rapid evidence review is to summarize the best available evidence regarding the effect of khat on health and socio-economic aspect to inform policy decision-makers.

Methods

A rapid evidence review approach, which was adapted from Supporting the Use of Research Evidence (SURE) guide for Rapid Response Services, was applied to search, appraise and summarize the best available evidence on the effect of khat on health and socio-economy. We identified the PICO concerning to the objective of the review to facilitate the searching of relevant articles.

PICO

Population: Human population regardless of age and sex

Intervention (exposure): Khat or *Catha edulis* use

Comparator: non-users of khat

Outcome: Health, economic and social effect

Inclusion criteria: The following criteria were used to include articles in this review.

Study Design: Systematic reviews, and experimental studies.

Context (setting): Global studies were considered without restriction to any geographical context.

Exclusion criteria: The following criteria were used to exclude articles in this review.

- Reviews that are not systematic and transparent (e.g. literature reviews)
- Cross-sectional studies
- *In vivo* and *in vitro* experiments
- Case series/case report
- Expert opinions and editorials
- Studies published other than the English language
- Studies with no free full texts
- Studies with synthetic cathinone which resembles the Khat effect

- Studies conducted with additional interventions like alcohol and tobacco

Search strategy: To answer the question under review we searched for high-quality studies (systematic reviews and RCT) from the following international databases: SUPPORT Summaries, Health Systems Evidence, Epistemonikos, PDQ-Evidence, the Cochrane Library, and PubMed. The search was made with no date or no language restriction. The last search was made on January 11, 2021.

PubMed: Khat* [tw] OR *Catha edulis* [tw] OR Chat [tw] OR "Substance abuse*" [tw] OR "Abyssinian tea" [tw] OR "African salad" [tw] OR "bushman's tea" [tw] OR Catha [tw] OR chat [tw] OR "flower of paradise" [tw] OR gat [tw] OR jaad [tw] OR kaad [tw] OR "leaf of Allah" [tw] OR mirra [tw] OR qaat [tw] OR qat [tw] OR "tea of the Arabs" [tw] OR "Natural amphetamine" [tw] OR stimulant [tw] OR "nervous system stimulant" cathinone [tw] OR "qat leaves" [TW] OR "Catha"[Mesh] OR "cathinone" [Supplementary Concept]

Cochrane Library: Khat or *Catha edulis*

Epistemonikos: Khat or *Catha edulis*

Google Scholar: "Khat"

Review findings

Based on the search strategy we found a total of 1350 studies from PubMed, Cochrane Epistemonikos and Google scholar. Using the eligibility criteria 13 articles were reviewed and summarized (9 systematic reviews and 3 randomized clinical trials). Summarization of the evidence was done under the following themes: effect of khat on oral health; cardiovascular; malignancy; physiological and metabolic effects, and neurology. Our search engine couldn't access articles on the socioeconomic effect of khat, but through contact with key personnel, we have added the best available evidence we managed to get in the area.

Effect of Khat

1. Effect of Khat on health

1.1 Effect of khat on oral health

We found two highly relevant systematic reviews and one experimental study that assessed the effect of khat on oral health.

- The findings from one of these studies show that khat chewing increased the odds of oral problems such as mucosal white lesions, gum recession, periodontal pocketing and gum bleeding (Kalakonda et al. 2017). Similarly, other systematic reviews exhibited a positive correlation between khat chewing and periodontal disease. Accordingly, the analysis of the evidence reveals that khat chewing is destructive to the periodontium and enhances the risk of periodontal disease progression (Astatkie et al. 2014). However, due to the variability of studies, more longitudinal case-controlled studies are highly warranted to establish a causal relation between khat chewing and periodontal disease.

- In contrast to the above findings from the systematic reviews, an experimental study that followed a group of chewers and non-chewers for 20 days indicated as Khat chewing is associated with lower Plaque Index (PI) scores; however, differences were only significant at day 20. The observed anti-plaque and anti-gingivitis properties indicate that khat chewing is probably not detrimental to the periodontium. The validity of previous findings supporting an opposite view is undermined by a lack of control for confounders, particularly smoking (Al-hebshi and Al-ak'hali 2010).

1.2 Effect of khat on cardiovascular health

We found two highly relevant systematic reviews that assessed the effect of khat on cardiovascular health.

- A systematic review done on the association between khat chewing and hypertension found out that there is no statistically significant association of khat chewing as an epidemiological risk factor for hypertension (Hassen et al. 2012). However, this conclusion is subject to a small number of studies with cross-sectional study design. Thus, there is a need for robust studies on khat as an epidemiologic risk factor for hypertension considering further aspects of chewing, like dose-response, duration of chewing and co-existence of other co-morbid factors of hypertension.
- To establish whether there is a risk factor for cardiovascular disorder from khat chewing a systematic review and meta-analysis was conducted in 2017. Based on the findings, khat chewing was highly associated with elevated Blood Pressure and heart rate which are established risk factors for cardiovascular diseases (Teshale and Nikodimos 2017).

1.3 Effect of khat on malignancy

We found one highly relevant systematic review and one experimental study that assessed the effect of khat on malignancy.

- The pooled analysis from a systematic review that evaluated the use of khat (*Catha edulis*) as a risk factor for cancer did not find a direct relationship between khat and cancer but the anti-cancer effect would require to be proofed on human studies (Chong and Alshagga 2020).
- In an experimental study, a standardized organic extract of khat induced a very consistent and reproducible type of cell death in various human leukaemia cell lines and peripheral human blood leukocytes. The potential mechanism(s) for khat-induced apoptosis in human leukaemic cells is unknown; however, the results on khat-induced apoptosis point to an activation of the extrinsic cell death pathway (Onyango et al. 2004).

1.4 Effect of khat on physiological and metabolic health

We found one systematic review and meta-analysis and one experimental crossover study conducted at the Substance Abuse Research Centre in Jazan University,

Saudi Arabia which assessed the effect of khat on physiological and metabolic health.

- Khat showed a clear enhancing effect on physical performance. Cathine/cathinone act as stimulants to increase the capacity to perform the exercise. Thus, khat produces the same effects which lead to the banning of amphetamine (Sallam et al. 2016).
- A systematic review and meta-analysis found it was difficult to draw a meaningful conclusion concerning the glycemic effect of *Catha edulis* since the meta-analysis results were insignificant with high heterogeneity among subgroups and are greatly conflicting (Alsalahi et al. 2016).

1.5 The effect of khat on neurological health

We found two highly relevant systematic reviews that assessed the effect of khat on neurological health.

- In one of the systematic review findings, the effect of acute, and sub-chronic exposure to khat showed that short-term memory appears to be affected depending on the duration of exposure. However, it did not show the effect on long-term memory (Berihu et al. 2017).
- There was a significant difference between the khat exposed and control group for the neurobehavioral changes in a systematic review done on the effect of khat on neurobehavioral functions. Although several studies regarding the topic are limited, there is high-quality evidence that indicates khat induce neurobehavioral changes (Berihu and Asfeha 2015).

2. Socio-economic Effects of khat

2.1 Effect of khat on societal aspect

A systematic review conducted on problematic Khat use constitutes but is not limited to, harms, increased use over time, and frequent engagement in other psychoactive substances misuse. Khat use is different from problematic khat use since it is occasional and used for prayer, social, and functional reasons. Strong empirical studies that could establish thresholds for patterns of problematic khat use and culturally suitable problematic khat use measures that follows a bottom-up approach of scale development are warranted (Mihretu et al. 2019). A primary study in Ethiopia indicated as the impact of khat chewing extends beyond the khat chewers themselves involving women, children and the entire community (Admassie 2017).

2.2 Economic implications of khat usage

We couldn't retrieve valuable and high-level evidence (systematic reviews and or RCT) about the effects of khat consumption on the economy of individuals, households of a country or region. Accordingly, reviewers thus call for setting this aspect of khat a future research agenda in which renowned calibre of economists participate. To pave the way for further high level global and regional decisions via robust research in this perspective, we have hereafter tried to summarize what has been written on economic aspects of khat

consumption whether that evidence is in the form of written books or articles of any type.

- A study from Kenya found that Khat consumption was widely accepted by all age groups and that the number of days Khat was consumed, the variety of Khat consumed, highest-level of education attained by the consumer, employment status and income had negative effects on the household economy. There was a significant association between household economy and marital status as well as employment status. Khat regulation was preferred as well as community sensitization on the implication of Khat consumption (Omar et al. 2019).
- A descriptive study from Somalia indicated that on the average users chewed over 250g of khat per day, spending an average of USD 7.29. Several scholars have argued that if Somalia did not import khat, the country would be one of the most socio-economically developed countries in Africa. The country would save millions of dollars every day, people who work would contribute their full income to their families, and there would be a greater impact on work performance in the areas that promote economic growth. The overall health of the nation would also be improved, further improving socio-economic conditions in Somalia (Awale and Ali 2018).
- A study conducted in the northern part of Ethiopia found out that khat chewers who participated in the study spent at least 500 ETB on khat per week even though more than half of the respondents were unwilling to disclose khat expenditure. Most khat chewers drank alcohol after chewing khat and smoked a cigarette and consumed peanut, coffee and soft drinks while practicing khat chewing (Eticha et al. 2016). A multiple-site study in Ethiopia including the experiences of Khat chewers in a rehabilitation center as a consequence of Khat chewing and its addictive nature found an escalating consumption/addiction and impacts of khat both in areas where a study is conducted (Assosa and Harari) and beyond in the country (Admassie 2017).
- Khat addicts and heavy users often access their khat supply through a vicious cycle of credit, credit payment, and back to credit, supplemented by cash-on-hand purchases with borrowed money that is followed by the uphill struggle to settle that debt, thereby ruining their household economy and shaming their family. The social impact of khat chewing extends beyond the khat chewers themselves involving women, children and the entire community (Admassie 2017).

Conflicts of interest: No conflicting of interest.

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