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Development of the Khat Knowledge, Attitudes, and Perception Scale (K-KAPS)

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Abstract

Introduction and aims: Khat (*Catha edulis*) is a stimulant plant widely used in East Africa and the Arabian Peninsula. Tobacco is often co-used with khat and its use has expanded to other parts of the world. Chronic khat use is associated with negative health consequences. There is a lack of research to develop a tool to assess attitudes toward khat use. This study aimed to develop a brief tool to assess attitude and perception related to khat (i.e. the Khat Knowledge, Attitudes and Perception Scale).

Design and Methods: Four-hundred and three participants in Yemen (151 concurrent users of khat and tobacco, 141 khat-only users and 92 nonusers of khat and tobacco) were asked about knowledge and attitudes related to khat. A principle component analysis with Promax rotation, scree plot and Cronbach's α coefficients was performed to examine psychometric properties of the Khat Knowledge, Attitudes and Perception Scale.

Results: Principle component analysis revealed five factors: Negative Beliefs, Positive Beliefs, Idleness, Weight Control and Family Issues. Internal consistency of items in Negative Beliefs, Positive Beliefs, Idleness, Weight Control and Family Issues were 0.88, 0.62, 0.62, 0.72 and 0.53, respectively. Greater Negative Beliefs was inversely correlated with Positive Beliefs but positively associated with Idleness, Weight Control and Family Issues. Concurrent users and khat-only users had lower scores on Negative Beliefs than non-users. Concurrent users had higher scores on Positive Beliefs than khat-only and non-users.

Discussion and Conclusions: These results provide initial support of the usefulness of the Khat Knowledge, Attitudes and Perception Scale.

Keywords

Catha; Tobacco; Attitude; Perception; Knowledge

Introduction

Khat (*Catha edulis*) is a stimulant plant widely cultivated in East Africa and the Arabian Peninsula and other parts of the world. Estimated prevalence of khat use is between 30% and 50% in Ethiopia [1,2], 40% and 68% in Yemen [3,4], and between 10% and 52% in Somalia [5–7]. Chewing fresh and young leaves of a khat tree is the most common mode of consumption. The chemical structure of cathinone, one of main constituents of khat, is similar to that of amphetamine with a lower potency [8,9]. Acute ingestion of khat induces dopaminergic and serotonergic actions in the central pathways [10]. Khat users report euphoria, increased alertness and flow of ideas shortly after consumption of khat; however, this experience is typically followed by depression, anxiety, irritability and insomnia [11–14].

Historically, khat was used in traditional wedding ceremonies [15]. More recently, khat has been used for recreational purposes. Chronic or excessive khat use is associated with negative health consequences such as an increased risk of myocardial infarction [16], worsening of ongoing psychopathology [6], impaired neurocognitive functions [17,18], and alterations in the central stress regulatory system [19, 20]. Underlying mechanisms of the effects of long-term khat use including those related to psychosocial factors have yet to be determined.

There is a paucity of quantitative research to identify knowledge, attitudes and perceptions that are associated with khat use. Wedegaertner and colleagues [21] asked khat users and non-users a variety of questions related to perceptions of khat use. In general, the authors found that nonusers reported strong beliefs that khat use contributes to social, familial, marital and health problems relative to khat users [21]. Social consequences and loss of work time predicted non-use in men while familial and health issues were predictive of non-use in women [21]. Results were informative in identifying gaps about khat use between users and nonusers as well as between men and women. However, there are several limitations in this study. First, they used a rather lengthy structured interview that included 57 separate questions, which may limit the efficiency of this assessment in many clinical and research settings. Second, their study allowed participants to answer “yes”, “no”, “partly” or “unsure/no response”. The inclusion of the categories “partly” and “unsure/no response” makes data analysis and interpretability very difficult. For instance, “unsure” and “no response” are two distinctly different answers and lumping them together obscures the interpretability of the response by that subject. Findings of that study were also limited by the lack of information on tobacco co-use. Khat is often consumed with tobacco in regions where khat is available [22,23]. It is possible that concurrent khat and tobacco users might have different perspectives toward khat use relative to khat-only users or nonusers of these substances. This has never been tested.

The overall goal of this study was to expand previous research and develop a brief tool to assess attitude and perception related to khat (i.e. the Khat Knowledge, Attitudes, and Perception Scale; K-KAPS), and examine its psychometric properties. We report results from a sample that consisted of khat users who smoked tobacco (concurrent khat and tobacco users), khat-only users, and non-users. We also added modifications in response

options to improve clarity (i.e. participants are allowed to answer only “I agree”, “I do not agree” or “I do not know”) and used a statistically sound approach to reduce the number of items. Availability of this scale should enhance practicality and objectivity of the assessment of khat use, which will inform efforts to develop strategies to promote changes in khat use behaviour.

Methods

Participants

Participants who completed this study were part of a research program that had a different focus. Earlier results from that study among khat users are published elsewhere [24–27]. A cross-sectional study with a convenience sampling method was conducted in two Yemeni cities, Taiz and Sana’a. Recruitment was completed in local markets and shopping centres in the two cities. To participate, individuals needed to be Yemeni natives, 18 years or above, and free from any major physical and psychiatric disorders (e.g. cardiovascular diseases, stroke, diabetes, depression, substance abuse). The study was reviewed and approved by the Institutional Review Board in Taiz and Sana’a Universities. A total of 403 participants completed the study.

Measures and procedure

Forty-three items on perceptions, attitudes, and knowledge related to khat were included in this study (see Table 1). The selection of items was completed by adaptation of items used in previous research [21], common knowledge, and observations among our team. In each statement, a respondent was asked to answer either “*I agree*”, “*I do not agree*”, or “*I do not know*.” Demographic information such as age, gender, education, marital status and employment status was collected. Two questions, “*Do you currently chew khat?*” and “*Do you currently smoke tobacco products?*” were asked to identify khat and tobacco users. Subjects were further asked about use patterns such as age of onset and duration of regular use.

Potential participants were approached by a trained research staff. They were informed that the study was voluntary and that they were free to withdraw at any moment without consequences. They were also assured that their responses to the study would be kept confidential. After written consent was obtained, a face-to-face interview (30 – 45 minutes long) was conducted. A series of questionnaires were used to screen recent history of major medical conditions. Participants were asked about demographics, patterns of substance use, and attitudes toward khat use. Participants were monetarily compensated for their participation.

Data analysis

Psychometric properties of the 43 items were examined using the Kaiser-Meyer-Olkin Test for the adequacy of samples, a principle component analysis, and Cronbach’s α coefficients. Because this study was the first of its kind, several exploratory principal component analyses with different rotation methods were performed. Results from the Promax rotation are reported here due to correlations found among extracted factors. A factor loading of 0.30 or

above was used as an *a priori* criterion for an item to be included in a factor. A Scree-plot was also used to guide the number of factors to be determined.

To examine whether khat-related knowledge differed as a function of khat use status and gender, a 3 khat use group (concurrent khat and tobacco user, khat-only user, nonuser) $\times$ 2 gender (female, male) analysis of variance was conducted on factors determined by principal component analyses. A total score was calculated in each factor by adding the number of 'I agree' responses in that factor. The *P*-value was adjusted using the Bonferroni correction (0.05 divided by the number of factors in the final model). Correlational analyses and chi-square tests were conducted among khat users (concurrent khat and tobacco users and khat-only users) to test relationships between khat-related attitudes and magnitude of khat use. These analyses were performed using IBM SPSS Statistics, version 24 (IBM Corp., Armonk, NY, USA).

Results

Participant characteristics

The majority of recruitment was completed in Taiz (74.4%). The mean age was 30.2 years (SD = 9.8) with 14.4 years of education (SD = 4.3). More than half of the subjects were women (51%) and married (52%). Forty-three percent were currently employed.

Psychometric properties of K-KAPS

The response rate of 43 items was 100%. The Kaiser-Meyer-Olkin index of 0.88 ($P < 0.001$) indicated adequacy of the sample size. Eleven factors were identified with Eigenvalues greater than 1. A five factor solution was used based upon the results of the Scree plot (see Figure 1).

Item loadings of extracted factors are described in Table 2. Thirteen items were loaded on the first factor, labelled Negative Beliefs. The second factor included nine items and was labelled as Positive Beliefs. The third factor represented items related to Idleness (IDL). The fourth factor reflected items regarding Weight Control. The fifth factor was called Family Issues (FAM). Each item was loaded exclusively on one factor except for one item "*khat causes many family problems*" that was loaded on two dimensions. Because this item loaded more strongly on Negative Beliefs than it did on Family Issues, it was included in that factor. Reliability as assessed by Cronbach's α was 0.88, 0.62, 0.62, 0.72 and 0.53 for Negative Beliefs, Positive Beliefs, IDL, Weight Control and Family Issues FAM, respectively. Correlational analysis found that individuals who endorsed Negative Beliefs were less likely to agree to Positive Beliefs ($r = -0.31$, $P < 0.001$) but more likely to agree to IDL ($r = 0.35$, $P < 0.001$), Weight Control ($r = 0.36$, $P < 0.001$) and Family Issues ($r = 0.45$, $P < 0.001$). Greater Positive Beliefs was associated with lower IDL ($r = -0.12$, $P = 0.017$), Weight Control ($r = -0.11$, $P = 0.032$) and Family Issues ($r = -0.27$, $P < 0.001$).

In addition, we conducted factor analysis using Mplus version 6.12 (Los Angeles, CA) with a procedure that takes into account the ordinal item responses. Results were generally in support of those above. Twelve of 13 items classified into Negative Belief in our initial analysis were grouped into one factor in this model (item 'family problem' was not

included). Similarly, eight of nine items that were classified into Positive Belief in our analysis grouped together (laziness was not included). All three items classified as Idleness and two of three items classified as Family Issue were grouped together as one factor in this additional analysis.

Group differences in K-KAPS

Of 403 participants, 151 (74 women) individuals identified themselves as concurrent users of khat and tobacco, 141 (76 women) identified themselves as khat-only users, 17 (2 women) mentioned that they smoked only, and 92 (52 women) reported that they had never regularly used khat and tobacco (i.e. non-users). Due to small sample size, tobacco-only users were excluded from further analysis. Also, two individuals who did not disclose substance use were removed. Reported years of education was greater in nonusers than in concurrent users ($F(2, 343) = 4.90, P = 0.008$). Khat-only users were more likely to be married than other groups ($\chi^2 = 14.2, P = 0.001$). Three groups did not differ in age, gender ratio,

On average, khat users started khat chewing when they were 17 years old (SD: 5.8), chewed khat 5 hours a day (SD: 2.3) and 5 days per week (SD: 2.1). Concurrent users started smoking when they were 18 years old (SD: 4.6), smoked 17 cigarettes per day (SD: 11.7) and used 1 waterpipe heads (SD: 0.6) per typical day.

An adjusted P -value for analysis of variance was set as 0.01 (0.05/5 factors). Results indicated a main effect of khat use group in Negative Beliefs ($F(2, 378) = 17.8, P < 0.001$) and Positive Beliefs ($F(2, 378) = 46.5, P < 0.001$). Multiple comparisons revealed that concurrent khat and tobacco users and khat-only users had lower scores on Negative Beliefs than nonusers ($P < 0.001$). There was no difference between concurrent and khat-only ($P = 0.33$). In contrast, concurrent users had higher scores on Positive Beliefs than khat-only ($P < 0.01$) and nonusers ($P < 0.001$). Khat-only had higher scores than nonusers ($P < 0.001$). Main effects of khat use ($F(2, 378) = 14.7, P < 0.001$) and gender ($F(1, 378) = 23.6, P < 0.001$) in Family Issues were qualified by a khat use by gender interaction ($F(2, 378) = 3.99, P = 0.02$). Women had lower scores than men among concurrent users ($p < 0.001$) and khat-only users ($P < 0.001$). However, this gender difference was not found in nonusers (see Figure 2). Khat main effects in Negative Beliefs ($F(2, 338) = 16.5, P < 0.001$) and Positive Beliefs ($F(2, 338) = 29.7, P < 0.001$) and the khat use by gender interaction in Family Issues ($F(2, 338) = 4.90, P = 0.008$) did not change when education and marital status were included as covariates.

Finally, a series of correlational analysis were conducted to test linkages between attitude factors and magnitude of khat and tobacco exposure. Khat users who reported higher Negative Beliefs were less likely to use khat (lower number of days per week [$r = -0.12, P = 0.047$], fewer hours per session [$r = -0.25, P < 0.001$]) and more likely to have quit attempts in the past ($r = 0.24, P < 0.001$). In contrast, khat users who had higher Positive Beliefs were more likely to use khat (greater number of days per week [$r = 0.23, P < 0.001$], longer hours per session [$r = 0.14, P < 0.02$]) and less likely to have quit attempts ($r = -0.32, P < 0.001$). Greater IDL was related to fewer hours of khat chewing per session ($r = -0.15, P = 0.01$)

and higher chance of having quit attempts ($r = 0.14$, $P = 0.02$). A greater score in Family Issues was linked to a younger age of onset of khat use ($r = -0.27$, $P < 0.001$).

Discussion

This study provided support for psychometric properties of K-KAPS. Underlying dimensions indicated by the factor analysis were in agreement with the literature on khat. The strongest factor identified in this study, labelled Negative Beliefs, was supported by a body of research reporting negative influences of khat use on physical [16], mental [6, 14, 28], and social [29] well-being. The second strongest factor, labelled Positive Beliefs which consisted of items with favourable views toward khat use, was also consistent with previous research demonstrating a belief in positive effects such as increased concentration and alertness as a motive for khat use [30]. Items included in IDL can represent behavioural characteristics of khat use. Users typically gather in the afternoon and spend several hours chewing khat as a means of socialisation [22]. It has been suggested that this use pattern inhibits work productivity and leads to financial problems [3]. Items grouped in Weight Control were consistent with appetite suppressant effects of cathinone, one of the main ingredients of khat [31,32]. Finally, Family Issues included items that describe unfavourable views toward khat use among women. Evidence indicates linkages between khat use and delivery complications [33] and negative mood during pregnancy [34]. In general, khat use has been stigmatised in East Africa and Middle East countries [35]. The total number of items retained based on the factor analysis was 30. Taken together, results of this study indicate that the K-KAPS captured important aspects of khat use with fewer items relative to the previous Wedegaertner et al. study [21].

Correlational analysis and analysis of variance also provided additional support for the validity of K-KAPS. Overall, individuals who supported positive effects of khat were more likely to disagree with negative consequences of khat. This relationship differed by khat use status. Khat users had lower scores on Negative Beliefs while higher scores on Positive Beliefs than nonusers of khat. These results collectively indicated that khat users underestimated negative health consequences while overestimating positive health effects of khat relative to nonusers. This is consistent with our previous research on khat use in Ethiopia [34] as well as studies on other substances showing that positive attitude and perception toward a drug is associated with maintenance of use [36, 37].

Positive attitude toward khat use was higher in concurrent khat and tobacco users than in khat-only users who had higher scores than nonusers. While the reason for the difference between concurrent and khat-only groups is not clear, some studies have suggested that tobacco smoking during a khat session enhances the impact of khat [23]. Both tobacco smoking (via nicotine) and khat chewing (via cathinone) induce pleasure, increase concentration, and reduce anxiety [28, 38]. Positive Beliefs included items such as “*khat improves the ability to remember*”, “*I feel well and relaxed while consuming khat*”, and “*khat consumption eases psychological and social stress.*” It is possible that high Positive Beliefs scores in concurrent users were associated with additive effects of khat and tobacco use. Future research should examine acute psychobiological effects of current khat and tobacco use as well as the role that continued tobacco use might play in the relapse rate of

khat abstainers. Asking smokers attitudes and perceptions related to tobacco use may also be beneficial in differentiating subjective effects of khat and tobacco.

There were gender differences in attitudes toward khat use. In concurrent and khat-only groups, but not in the non-using group, women were less likely to endorse that khat use is related to familial issues than men. This factor included items with an unfavourable view toward women's khat use (e.g., "*Women should not use khat because it is harmful to the family*," "*Khat consumption during pregnancy harms the health of the fetus*"). It is reasonable that female khat users were more likely to disagree with those statements, resulting in gender differences. The fact that this gender difference was not found in nonusers provides support for this hypothesis.

This study demonstrated a positive relationship between attitudes toward khat use and magnitude of exposure to khat. Among khat users, higher levels of Negative Beliefs were associated with lighter khat use (lower number of days per week, fewer hours per session) and increased likelihood of previous quit attempts. In contrast, higher Positive Beliefs was related to greater frequency of khat use and higher FAM was linked to a younger age of onset of khat use.

Results of this study were limited by the use of a cross-sectional method. We cannot draw any conclusions regarding whether certain attitudes and perceptions caused khat use or if chronic khat use modified attitudes and perceptions toward the substance over time. Future studies should include prospective research design and test-retest reliability studies. A lack of biological or biochemical samples for the assessment of drug exposure also limited results related to substance use. Results of this study cannot be generalised to the entire population due to the use of a convenience sampling in limited locations. A face-to-face interview approach might also introduce social desirability, which may lead to bias in participant responses because substance use is stigmatised, especially among women in the region. However, we note that this method has been effective in settings where illiteracy is not uncommon. Finally, more research is needed to elucidate cross-cultural differences in social context and attitudes toward khat use. This study did not include smokers who did not chewed khat. Tobacco use is common among khat users in Yemen and we encountered challenges in recruiting these individuals. We did not ask about the use of illicit drugs, and the role of co-use of other substances with khat is therefore not clear at this time.

This study did have several useful implications. First, the number of items included in K-KAPS is about 50% less than the previous study, which is efficient and less burdensome. Second, our results indicated that knowledge, attitudes, and perceptions serve as risk and protective factors of khat use. Nonusers were more likely to agree with potential harm and disagree with benefits related to khat use relative to khat users and concurrent khat and tobacco users. In addition, those khat users who underestimated negative health effects of khat were more likely to be regular consumers. Intervention strategies focusing on health education may contribute to a reduction in khat use. For instance, our findings could inform efforts to develop prevention programs focusing on youth to increase awareness of health risks related to khat, education programs for medical patients that are currently using khat, and coupling the survey as part of a motivational interview technique for patients who desire

to quit khat use or are referred for khat cessation treatment. Targeting the modification of positive attitudes and an increase in awareness of health consequences may be particularly beneficial because khat use has a long tradition in society.

In conclusion, this study demonstrated initial evidence to support psychometric properties of K-KAPS. Future research is warranted to examine K-KAPS and characterise individuals who abuse khat.

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Figure 1.
Scree plot

Figure 2.

Khat by gender interaction in family problems. Follow-up analyses indicated significant gender differences in concurrent ($P < 0.001$) and khat-only ($P < 0.001$) groups but not in non-using group

Table 1.

Items related to knowledge, attitudes and perception of khat

#	Name	Description
1.	Poverty	Khat depletes financial resources
2.	Alertness	Khat improves alertness
3.	Waste of time	Khat consumption leads to loss of time
4.	Loss of appetite	Khat causes loss of appetite
5.	Less sleep	Khat reduces the need for sleep
6.	Malnutrition	Khat leads to malnutrition
7.	Bad habit	Khat consumption is a bad habit and should be eliminated
8.	Health problem	Khat consumptions is bad for one's health
9.	Constipation	Khat causes constipation
10.	Pregnancy	Khat consumption during pregnancy harms the health of the fetus
11.	Laziness	Khat causes laziness
12.	Neglect	Khat consumption causes neglect of children and the household
13.	Mood problem	Khat causes mood disorders
14.	Oral problem	Khat causes oral health problems
15.	Concentration	Khat consumption helps one to focus and pay attention
16.	Back pain	Khat can cause back problems as a result of sitting for a long time
17.	Reduce stress	Khat consumption eases psychological and social stress
18.	Women	Women should not use khat because it is harmful to the family
19.	Solve social problem	Khat rituals solve social problems
20.	Neurological problem	Khat causes nervous disorders
21.	Finance problem	Khat causes financial damage to the entire family
22.	Haemorrhoids	Khat causes the haemorrhoids
23.	Family problem	Khat causes many family problems
24.	Problem in kids	Khat use by parents leads to behavioural disorders in their children
25.	Physical fit	Khat improves physical fitness
26.	Anxiety	Khat causes anxiety and tension
27.	Social problem	Khat causes social problems
28.	Parent-kids relation	Khat use impairs the relationships between parents and their children
29.	Addiction	Khat is addictive
30.	Reduce drug use	Khat consumption reduces the use of other drugs
31.	Sexual activity	Khat improves the experience during sexual intercourse
32.	Depression	Khat causes depression
33.	Reduce blood sugar	Khat causes low blood sugar
34.	Divorce	Khat consumption is a factor in divorces
35.	Boredom	Khat causes boredom
36.	Crime	Khat consumption causes a higher crime rate in the society
37.	Solve social relations	Khat consumption improves social relationships
38.	Drug	Khat is a drug
39.	Aggression	Khat causes aggression between spouses

#	Name	Description
40.	Memory	Khat improves the ability to remember
41.	Appearance	Khat helps to reduce weight and improve appearance
42.	Relaxation	I feel well and relaxed while consuming khat
43.	Leisure	Khat chewing is the best way to spend time

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Table 2.

Factorial structure of items included in Khat Knowledge, Attitudes and Perception Scale (30 items).

	Factors				
	Negative beliefs	Positive beliefs	Idleness	Weight control	Family issues
Neurological problem	0.95	-0.05	-0.02	-0.03	-0.27
Anxiety	0.80	0.03	0.01	-0.05	-0.04
Divorce	0.73	0.06	0.01	-0.02	0.10
Social problem	0.66	-0.03	-0.12	-0.04	0.12
Boredom	0.64	0.03	0.08	-0.05	-0.04
Crime	0.55	0.16	-0.08	0.01	0.08
Depression	0.55	-0.11	-0.01	-0.04	-0.08
Aggression	0.51	0.01	0.04	0.02	0.14
Mood problem	0.40	-0.13	-0.02	-0.05	-0.12
Haemorrhoids	0.36	0.03	0.04	0.03	-0.04
Parent-kids relationship	0.34	0.05	-0.06	0.23	0.14
Problem in kids	0.34	0.12	-0.01	0.24	0.21
Family problem	0.330	-0.05	0.19	-0.08	(0.327) ^a
Memory	0.12	0.71	-0.05	-0.21	0.10
Relaxation	0.02	0.64	-0.08	-0.01	-0.14
Leisure	-0.07	0.63	0.05	0.05	-0.14
Concentration	0.02	0.51	-0.02	0.02	0.08
Appearance	0.10	0.51	0.11	0.05	-0.14
Sexual activity	0.01	0.35	0.06	0.02	0.09
Solve social relations	-0.17	0.33	-0.05	0.01	0.01
Reduce drug use	-0.05	0.30	0.05	0.02	0.10
Laziness	-0.02	-0.30	0.13	-0.09	0.07
Poverty	-0.19	-0.01	0.63	-0.10	0.09
Waste of time	0.15	0.03	0.62	0.15	-0.03
Finance problem	0.09	0.05	0.47	-0.03	0.28
Loss of appetite	-0.01	-0.09	0.04	0.82	-0.10
Malnutrition	-0.01	0.01	-0.04	0.68	-0.10
Neglect	0.03	-0.08	0.06	-0.09	0.71
Women	-0.06	0.05	0.14	-0.08	0.62
Pregnancy	0.04	-0.08	-0.19	-0.07	0.35
Variance accounted (%)	20.65	7.45	5.14	3.93	3.38
Eigenvalues	8.88	3.20	2.21	1.69	1.45
Chronbach's α	0.88	0.62	0.62	0.72	0.53

Note. Items in bold font were grouped together to form a factor.

^aThis item was included in the negative beliefs factor because it has higher loadings than the family issues factor.