

ORIGINAL INVESTIGATION

Gender Differences in Patterns and Correlates of Khat and Tobacco Use

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ABSTRACT

Introduction: Although research suggests gender differences in patterns of tobacco use, whether gender moderates concurrent use of tobacco and other substances remains unclear. In some parts of Africa and the Middle East, tobacco is often accompanied with khat (*Catha edulis*), a widely used substance in these regions. The concurrent use of tobacco and khat may represent a public health burden spreading to other countries in Europe and North America.

Method: A total of 189 participants (69 women) khat users and smokers in Yemen were asked to complete questionnaires that focused on patterns of khat and tobacco use. Chi-square tests, analyses of variance, and correlational analyses were conducted.

Results: Reported frequency and intensity of khat and tobacco use were greater among men than in women. Also, reported number of cigarettes smoked during a khat session was higher among men than among women, whereas frequency of waterpipe use during the session was greater among women than among men. Smoking status (daily or occasional) was positively associated with khat use in women only. Age of onset of khat use was inversely related to the number of cigarettes smoked during a khat session and with intensity of khat chewing. The majority of participants reported that they had thought about and have attempted to quit khat and tobacco use.

Conclusions: The results provide evidence for gender differences in patterns of concurrent use of tobacco and khat. Identifying determinants of tobacco and khat use may be useful in reducing the risk of their negative health outcomes.

INTRODUCTION

Accumulating evidence indicates that men and women have different patterns of tobacco use (Eriksen, Mackay, & Ross, 2012). However, the extent to which gender moderates concurrent use of tobacco and other substances is largely unknown. In some African and Middle Eastern countries, tobacco is often accompanied with khat (*Catha edulis*), a widely used substance in these regions (Ayana & Mekonen, 2004; Belew, Kebede, Kassaye, & Enquoselassie, 2000; Griffiths, 1998; Kassim, Islam, & Croucher, 2011). Recent epidemiological data show that more than 70% of men and 30% of women in Yemen are daily khat users (The World Bank, 2007). Khat is an evergreen shrub that grows in East Africa and the Arabic Peninsula, which is often consumed by chewing fresh or young leaves (Al-Motarreb, Baker, & Broadley, 2002). Khat sessions are usually held as a means of socialization, and users often report euphoria, alertness, friendliness, energy, confidence, and flow of ideas (Balint, Falkay, & Balint, 2009; Cox & Rampes, 2003). These symptoms are followed by anxiety, irritability, and restlessness (Hoffman & al'Absi, 2010).

Chemical structure of khat has been shown to be similar to that of amphetamine (Feyissa & Kelly, 2008). Research has shown a link between chronic khat use and health risks, including cardiac events (Al-Motarreb et al., 2005; Ali et al., 2011) and psychotic symptoms (Odenwald et al., 2005). The mechanisms of khat effects on health are still largely unknown (Warfa et al., 2007). It is possible that multiple behavioral, psychological, and physiological factors are involved in mediating these effects of chronic khat use (al'Absi et al., in press).

The concurrent use of tobacco and khat may represent a public health burden in countries where these substances are used in combination, as tobacco use is a well-known factor for the development of various physical diseases (al'Absi & Grabowski, 2011; Centers for Disease Control and Prevention, 2008). Regional studies show that up to 61% of khat chewers smoke cigarettes (Tesfaye, Byass, Wall, Berhane, & Bonita, 2008). Others also report higher prevalence of cigarette smoking among khat users relative to nonkhat users (Ali et al., 2011; Ayana & Mekonen, 2004) and positive associations between levels of khat dependence and nicotine dependence (Kassim et al., 2011). However, the extent to which gender moderates

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concurrent use of these substances has not been directly tested. There is a reason to believe that patterns of tobacco use among female khat users may be different from those of their counterparts because smoking is socially stigmatized among women in Middle Eastern societies (Maziak, 2002). The current study, therefore, examined the role of gender in khat and tobacco consumption behavior in a Yemeni sample.

METHODS

Participants and Apparatus

Participant recruitment was completed at two universities in Yemen, Sana'a University and Taiz University, by posting flyers around the campus and in the university and surrounding community. Participants were included in the study if they were generally healthy and not using any prescribed medications. In addition, they must have completed at least a high school education level to ensure their ability to understand and complete self-report forms used in this study. Those who met the criteria read and signed a consent form approved by the research ethical committee at Sana'a and Taiz Universities. Data collection was accomplished by completing self-report questionnaires. Participants were asked to complete a battery of forms regarding demographic information (e.g., age) as well as khat and tobacco use on a typical occasion (e.g., average number of cigarettes per day, average number of khat sessions in a typical week). Participants were also asked whether they had ever thought about or had attempted to quit smoking or quit khat chewing. One-hundred and eighty-nine (69 female) individuals identified themselves as khat users. Of them, 104 (39 women) reported that they use tobacco as well. The majority of the participants were college students.

Data Analysis

Gender differences in khat use was examined using the entire sample ($n = 189$) while the role of gender in concurrent use was tested using the subgroup of the sample that used both substances ($n = 104$). Chi-square tests and analysis of variance (ANOVA) were conducted to examine the extent to which gender moderated demographic variables and patterns of khat and tobacco use. Correlational analysis was conducted to test the relationship between khat and smoking variables. Variations existed between sample size and degrees of freedom for the reported variables due to missing data. Also, minor variations in the data collections occurred between the two universities leading to a few missing questions in the Sana'a University component. Finally, our preliminary analysis found that reported duration and frequency of khat use, duration of smoking, and average number of cigarettes per day and during a khat session differed between the two sites ($ps < .05$). Since the primary purpose of collecting data at these sites was to maximize the diversity of the sample, rather than to compare regional differences in khat and tobacco use, site was included as a covariate in testing these measures.

RESULTS

Men and women in our sample did not differ in age ($p = .13$), however, women had greater body mass index than men

($F(1, 183) = 3.76, p = .05$; see Table 1). The average age of these individuals started chewing khat was 16.6, and 74% of them consumed it regularly. On average, they chew it 4.8 hours per session and 5.6 times a week. However, men and women had different patterns of khat use. Men reported that they started chewing khat earlier than women ($F(1, 186) = 17.8, p < .001$). More men than women mentioned that they chew khat on a regular basis ($\chi^2 = 27.1, p < .001$), spend more time chewing it per typical session ($F(1, 186) = 15.5, p < .001$), and use it more frequently per week ($F(1, 182) = 18.4, p < .001$; see Table 1). Seventy percent of khat users had thought about quitting and 41% had attempted to quit chewing at least once in their lifetime.

Concurrent users of tobacco and khat did not differ from khat-only users with respect to khat consumption behavior except that reported hours of khat chewing per typical session was longer in the concurrent group than in the khat-only group ($F(1, 184) = 8.39, p < .01$; see Figure 1). Gender was also associated with tobacco use among khat users. More than two thirds of men reported that they consume tobacco daily while only one third of women said they smoke regularly ($\chi^2 = 11.6, p < .01$; see Table 1). Within these habitual users, cigarette smoking was more prevalent in men relative to women ($\chi^2 = 41.0, p < .001$) while waterpipe smoking was more common among women as compared with men ($\chi^2 = 22.2, p < .001$). Reported consumption of cigarettes per day was greater in men than in women ($F(1, 100) = 69.1, p < .001$). Tobacco product used during a khat session was different between men and women; relative to their counterparts, the number of cigarettes smoked was greater in men ($F(1, 99) = 52.0, p < .001$), whereas the number of waterpipe heads smoked was higher among women ($F(1, 71) = 51.8, p < .001$). The majority (55%) of men cited that they smoked their first cigarette after breakfast, while 87% of women said that they used it only when they were chewing khat ($\chi^2 = 34.9, p < .001$). Men were more likely to smoke before they went to bed than women ($\chi^2 = 12.2, p < .001$). Both men and women mentioned that they had thought about quitting smoking (90%) and had tried quitting smoking in the past (66%).

Correlational analysis showed associations between tobacco and khat use. Reported number of cigarettes smoked during a typical khat session was inversely related to age of onset of khat use ($r = -.29, p < .01$) but was positively linked to number of hours spent chewing khat per session ($r = .26, p < .01$), number of times of khat sessions per week ($r = .41, p < .001$), and number of years of khat use ($r = .22, p < .05$; see Figure 2). Similar results were obtained between the number of cigarettes per day and frequency of khat use (hours per day, times per week, duration in years; $ps < .05$).

Years of smoking was positively correlated with the number of khat use episodes per week ($r = .30, p < .01$) and number of years of khat use ($r = .53, p < .001$). Furthermore, gender was associated with the link between tobacco and khat consumption. There was a gender \times smoking status (daily or occasional use) interaction in the number of khat sessions per week ($F(1, 98) = 18.35, p < .001$). One-way ANOVAs conducted separately by gender with Bonferroni corrections indicated that while daily smoking was related to an increase in khat use among women ($F(1, 36) = 25.71, p < .001$), this was not the case in men ($F(1, 62) = 2.10, p = .15$; see Figure 3). Finally, age of onset of khat use was inversely correlated with frequency of

Tobacco and khat use

Table 1. Gender Differences in Demographic Characteristics and Smoking Behavior Among Khat Users

	Overall (n = 189)	Women (n = 69)	Men (n = 120)	p value
Age (years)	24.8 (0.4)	25.4 (0.6)	24.1 (0.5)	ns
Body mass index (kg/m ²)	21.6 (0.3)	22.1 (0.4)	21.1 (0.3)	.05
Khat use				
Age started using	16.6 (0.3)	17.8 (0.5)	15.4 (0.3)	<.001
Daily khat use (%)	74.1	52.2	86.7	<.001
Duration (years) ^a	6.4 (0.4)	6.1 (0.6)	6.8 (0.4)	ns
Length (hours per typical session)	4.8 (0.2)	4.2 (0.3)	5.4 (0.2)	<.001
Frequency (average times per week) ^a	5.6 (0.2)	5.0 (0.2)	6.2 (0.2)	<.001
Ever thought about quitting (%)	70.2	72.5	68.9	ns
Ever tried quitting (%)	41.5	42.0	41.2	ns
Tobacco use^b				
Daily tobacco use (%)	54.8	33.3	67.7	<.01
Cigarettes ^c	82.5	23.1	100	<.001
Waterpipe ^c	26.3	76.9	11.4	<.001
Duration (years) ^a	5.6 (0.5)	5.4 (0.7)	5.7 (0.5)	ns
Number of cigarettes (average per day) ^a	8.8 (0.7)	3.7 (1.1)	14.0 (0.7)	<.001
Number of cigarettes during a typical khat session ^a	6.6 (0.6)	2.8 (0.9)	10.5 (0.6)	<.001
Number of waterpipe during a typical khat session ^d	1.1 (0.1)	2.1 (0.2)	0.2 (0.2)	<.001
I use my first tobacco product (%)				
When I wake up	6.7	5.1	7.7	
After breakfast	35.6	2.6	55.4	
Mid morning	4.8	5.1	4.6	
Only when chewing khat	51.9	87.2	30.8	
Other	1.0	0	1.5	
Use tobacco before going to bed (%) ^d	48.6	27.8	68.4	<.001
Ever thought about quitting (%) ^d	90.5	86.1	94.7	ns
Ever tried quitting (%)	66.3	56.4	72.6	ns

Note. Unless indicated in percentage, entries show mean and standard error of the mean.

^aReported means are adjusted for site.

^bOne-hundred and four (39 women) khat users reported that they also consume tobacco.

^cEntries represent prevalence within daily tobacco users.

^dData collected only at Taiz University (38 male and 36 female concurrent users).

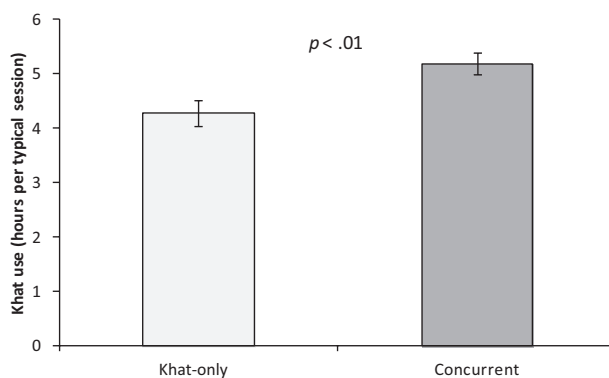


Figure 1. Differences in hours of khat use per typical session between khat-only and concurrent users.

khat use (hours per session: $r = -.31$, $p < .01$; times per week: $r = -.34$, $p < .001$; years of khat use: $r = -.28$, $p < .01$).

DISCUSSION

More than 70% of khat users in the current sample of Yemeni adults reported that they consume khat on a regular basis. The average age of onset of khat use was 17, and these individuals spend 5 hr a day chewing almost every day. These confirm

previous studies (Al-Motarreb et al., 2002; The World Bank, 2007). Also as expected, men reported that they consume khat and tobacco more intensely and frequently than women, supporting that these substances are more widely accepted among men as compared with women in Middle Eastern countries (Maziak, 2002; The World Bank, 2007).

The current study found that men and women use different tobacco products during a khat session. Men were more likely to smoke cigarettes, whereas women tended to smoke waterpipe. Studies have reported gender differences in social

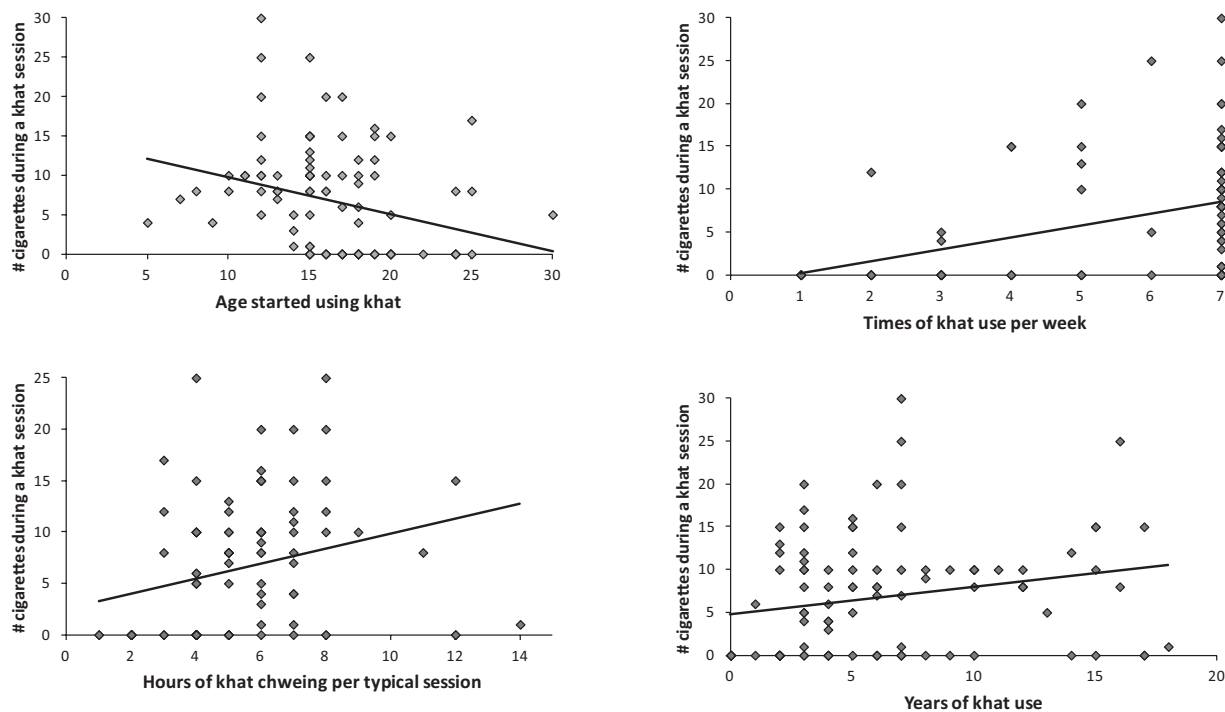


Figure 2. Associations between khat-related variables (age of onset, hours per typical session, times per week, duration in years) and the number of cigarettes consumed during a khat session.

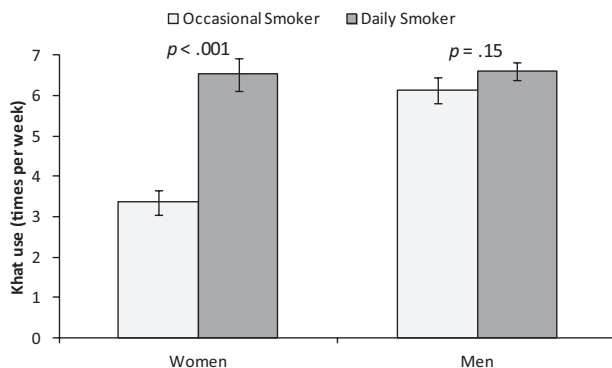


Figure 3. A gender × smoking status interaction in the number of khat sessions held per week. Smoking status (occasional or daily) was associated with khat use among women while this was not the case with men as found by simple effects tests.

perception of cigarette and waterpipe smoking. For example, cigarette smoking is generally considered “men’s thing” and viewed as unfavorable behavior for women in Middle Eastern countries (Maziak, 2002). In contrast, waterpipe smoking is generally viewed as more socially positive and trendy as compared with cigarette smoking (Hammal, Mock, Ward, Eissenberg, & Maziak, 2008; Maziak et al., 2004). Family attitude toward the use of waterpipe by women is more lenient than its use by men (Maziak et al., 2004). These findings suggest that waterpipe smoking is more culturally accepted than cigarette smoking for women.

Another possibility is gender differences in taste perception of khat. Epidemiological data report that female nonusers do not chew khat because of its bitter taste more so than men (The World Bank, 2007). Because aroma and taste are often attributed to the use of waterpipe (Maziak et al., 2004), it is possible that women khat users consume flavored waterpipe to manage the

bitterness of the leaves. The findings that 87% of women cited that they smoke only when they chewed khat (vs. 30% of men), while the majority of men (>55%) endorsed that they smoke their first cigarette after breakfast and smoke before going to bed (compared with less than 30% of women) may further suggest that tobacco use among women may be situation specific. Taken together, social, motivational, and psychopharmacological processes may be associated with different patterns of tobacco use between male and female khat users. Our findings extend previous work by pointing out the need to take into account gender differences when examining concurrent use of khat and tobacco.

The current study also evidenced intense khat use among smokers. Concurrent users reported that they chew khat longer within each session than khat-alone users. In addition, greater number of cigarettes was associated with greater hours of chewing khat, times of khat sessions per week, and duration (years) of khat use. Furthermore, the relationship between tobacco and

Tobacco and khat use

khat use differed by gender. Female habitual smokers reported a greater number of khat sessions per week than female occasional smokers. This was not found in male tobacco users, however (Figure 3). Although we cannot comment from the collected data on any causal directions between khat use and smoking, the findings extend previous work that point to the close link between these substances (Ayana & Mekonen, 2004; Griffiths, 1998; Kassim et al., 2011). The underlying psychobiological mechanisms of this link remain unclear, although it is possible that social cues and pharmacological priming associated with khat use may increase the likelihood and reinforcing effects of smoking (Kassim et al., 2011). This hypothesis and implications of the simultaneous use of tobacco and khat on the reinforcement value drawn from each substance should be examined.

Our results suggest that age of onset of khat use may increase risk for using both substances. The younger the individual started chewing khat the more cigarettes they consumed during a khat session as well as during the day. Age of onset of khat use was also linked to frequency and intensity of khat chewing. Although these results are correlational, our findings and related work suggest that khat may function as a gateway to tobacco use. In this study, the duration of khat use was greater than that of tobacco use. We note that we experienced difficulties in recruiting tobacco-only users. In Yemen, khat use is widely accepted (Ayana & Mekonen, 2004; Belew et al., 2000; Griffiths, 1998; Kassim et al., 2011) and regarded as an important component of socialization, while tobacco use, especially cigarettes, is viewed as “men’s thing” and stigmatized among women (Maziak, 2002). These observations, therefore, suggest that khat is more culturally accessible than tobacco. Because tobacco (Centers for Disease Control and Prevention, 2008) and khat (Al-Motarreb et al., 2005; Ali et al., 2011; Odenwald et al., 2005) are associated with various medical conditions, it is possible that individuals who start chewing khat early in their life may be at greater risk of negative health outcome. Another novel finding in this study is that the majority of participants in this study reported that they had thought about quitting both khat and tobacco, and a significant portion had actually attempted to stop smoking. These findings reflect the need for systematic cessation research, which could lead to the development of effective interventions to prevent youngsters from initiating these substances.

Little is known about the health consequences associated with concurrent use of khat and tobacco although investigators have pointed out the potential public health burden caused by the combination of these substances (al’Absi & Grabowski, 2011). Studies have reported that khat chewers may have enhanced risk of suffering cardiac events (Al-Motarreb et al., 2005; Ali et al., 2011) and psychotic symptoms (Odenwald et al., 2005). A recent report (al’Absi et al., in press) showed attenuated blood pressure response to laboratory stress as well as blunted diurnal fluctuations in hormonal levels and increased negative affect during the day among khat users relative to healthy controls. These observations have been reported among habitual smokers (al’Absi et al., 2002). Dysregulation in physiological stress response has been suggested as a one of the mechanisms associated with increased risk for cardiovascular and other chronic diseases (McEwen, 1998). The extent to which chronic smoking and khat chewing are predictive of cardiovascular morbidity and mortality and psychotic disorders should be examined in future research. Sociocultural influence should also be taken

into account in testing this model as our data and other studies (Warfa et al., 2007) suggest its role in khat and tobacco use.

The results of this study are considered preliminary and future work should examine these associations in larger sample and of different age groups and in other countries. We note, however, that the results expand to some extent results related to tobacco use among this age group in the region (Maziak, 2002). Future research should incorporate longitudinal cohort to address the causal direction of the observed relationship between khat and tobacco use. In addition, the extent to which gender moderates the link between khat and smoking should be tested across different populations to account for specific local and sociocultural factors. These approaches would improve ability to develop targeted, effective, and well-tailored strategies for prevention and intervention of tobacco use and its public health burden.

In conclusion, this study provides the first evidence indicating gender differences in khat and tobacco use among concurrent users. Men reported that they consume khat and tobacco more regularly and frequently than women. The number of cigarettes smoked during a khat session was greater among men relative to women. In contrast, the number of waterpipe heads smoked during a khat session was greater among women than in men. Smoking among female khat users appeared to be conditional as most of them reported that they smoke while khat chewing. Khat use was positively associated with cigarette consumption. Age of onset of khat use was inversely related to the frequency of cigarettes smoked during a khat session and intensity of khat chewing. The majority of participants reported that they had thought about quitting khat and tobacco at least once in their lifetime. Identifying factors and mechanisms associated with gender differences in concurrent use of khat and tobacco may be useful in reducing the risk of health problems associated with these substances.

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DECLARATION OF INTERESTS

None declared.

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