Associations between khat use and HIV risk and status among voluntary counseling and testing center clients in Addis Ababa, Ethiopia

Della Berhanu[a], **Marie Diener-West**[b], **Andrea Ruff**[c], **Wendy W. Davis**[d], **David D. Celentano**[d], and **Vivian F. Go**[e]

[a]Department of Disease Control, Faculty of Infectious & Tropical Diseases, London School of Hygiene & Tropical Medicine, London, UK

[b]Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

[c]Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

[d]Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, USA

[e]Department of Health Behavior, University of North Carolina, Gillings School of Global Public Health, USA

Abstract

Objectives—Ethiopia is one of 15 countries that account for nearly 75% of all people living with HIV. Khat use, a common practice in Ethiopia and sub Saharan Africa, has gained attention as a potential risk factor for HIV. Our objective was to evaluate associations between khat use and demographic and risk-taking characteristics (alcohol use, sexual behavior) and also associations between HIV status and these characteristics among voluntary counseling and testing (VCT) clients in Addis Ababa, Ethiopia.

Methods—This cross-sectional study was conducted among Pro Pride VCT center clients, aged 18–49, from November 2009–March 2010. All clients were approached and 98.8% of these (684) completed a self-administered questionnaire. Associations between khat use, alcohol use, multiple sexual partners and HIV status were assessed using logistic regression models.

Results—Using khat in the past 90 days (current khat use) was significantly associated with being Muslim, being male, alcohol use and having a greater number of sex partners in one's lifetime. The adjusted odds of current khat use was almost 7-fold higher in those having four or more sexual partners in their lifetime (aOR = 6.89; 95% CI = 3.87, 12.25) as compared to those with one or none. HIV-positive status was significantly associated with age, employment, marital status, number of sex partners in one's lifetime and khat use. Having used khat in one's lifetime but not currently, past khat use, was associated with over a 2-fold increased adjusted odds (aOR =2.64; 95% CI = 1.13, 6.19) of being HIV infected.

Conclusions—Our findings highlight associations between current khat use and the modifiable factors of number of lifetime sexual partners and alcohol use. In addition, we observed the association between HIV status and past khat use after adjusting for age, marital status and number of sex partners in one's lifetime.

INTRODUCTION

In Sub-Saharan Africa, the region hit hardest by the HIV epidemic, nearly one in every 20 adults is living with HIV (PLHIV) (UNAIDS, 2014). With an HIV prevalence of 1.3% and an estimated 760,000 PLHIV, Ethiopia is one of the most heavily affected countries in sub-Saharan Africa (UNAIDS, 2013) and one of 15 countries that account for nearly 75% of all PLHIV (UNAIDS, 2014). Khat use, a common practice in sub Saharan Africa and Ethiopia, has recently gained attention as a potential risk factor for HIV (Alemu et al., 2007, Kebede et al., 2005, Abebe et al. 2005, Seme et al. 2005).

Khat (*Catha edulis)* is a shrub or tree whose leaves have been used for centuries by people from East Africa and parts of the Arabian Peninsula (Gebissa, 2010a). In Ethiopia, khat has historically been used by Muslim males during prayer and more recently to alter mood, increase energy and improve work performance (Kebede et al., 2005; Gebissa, 2010b; Dawit et al., 2006). Currently, 15% of individuals aged 15 to 49 report using khat, though this number can be as high as 50% in some regions (Halle and Lakew, 2015).

While Khat contains many different compounds and therefore using khat may have many different effects (WHO, 2006), the primary psychoactive compounds in Khat include cathinone (Schedule I) and cathine (Schedule IV) (Abebe et al., 2005; Balint et al., 2009; WHO, 2006). Cathinone has the same structure as dextroamphetamine (dexedrine) and is thought to be the primary psychoactive substance in khat (WHO). Like amphetamine, cathinone affects the central nervous system although its impact is more rapid and shorter lived (Colzato et al., 2013). Cathinone alters the release of dopamine, the neurotransmitter that is centrally important in controlling thoughts and goal directed behavior (Colzato et al., 2013). Like chronic amphetamine use, cathinone has been shown to impair cognitive capacity in areas such as response inhibition, cognitive flexibility and response conflict (Colzato et al., 2013).

It has been suggested that khat use increases sexual arousal and impairs rational judgment leading to unsafe sex (Abebe et al., 2005). Previous cross sectional surveys have shown that khat use is associated with earlier sexual initiation (Tilahun and Ayele, 2013), risky sexual behavior in street youth (Tadesse et al., 2013), multiple sexual partners in secondary school youth (Menna et al., 2014) and among university students (Mulu and Abera, 2014), and sex with a commercial or non-regular sexual partner among 15–24 year olds (Alemu et al., 2007).

Using khat is also associated with elevated alcohol use (Dawit et al., 2006) and alcohol use disorders (Soboka et al., 2015). Khat users report that alcohol helps them manage side effects that are sometimes associated with khat use including insomnia, anxiety, and, for some men, impaired sexual performance or impotence despite the increased sexual desire

associated with khat use (Dawit et al., 2006, Berhanu et al 2012). Increased alcohol use may also lead to increased sexual risk taking (Alemu et al., 2007, Kebede et al., 2005, Seme et al., 2005, Molla et al., 2008, Taffa et al., 2002, Mbulaiteye et al., 2000). A case control study of 425 HIV positive and 425 HIV negative individuals who were tested for HIV at 17 voluntary counseling and testing (VCT) centres in Ethiopia showed that alcohol drinkers who used khat were more likely to be HIV infected than those who were non-users (Abebe et al., 2005). These findings suggest a possible interplay between the use of alcohol and khat in supporting risky sexual behavior.

Despite this previous research on sexual risk, alcohol use and khat, our knowledge base about khat remains highly limited (Kassim & Al'absi, 2015) especially with respect to associations between khat use and HIV status and HIV risk. Our objective in this study was to evaluate the association between khat use and HIV status and HIV risk as well as characteristics associated with khat use among VCT clients aged 18–49 years, in Addis Ababa, which has an HIV prevalence of 5.2% (UNAIDS, 2014).

METHODS

Setting and participants

This study was conducted in the capital city of Ethiopia, Addis Ababa, which has a population of 3.0 million people (Central Statistical Agency, Ethiopia 2012). Data were collected at the Pro Pride HIV voluntary counseling and testing (VCT) center. Pro Pride is located in the Merkato, one of the largest open air markets in Africa, in Addis Ketema, one of the ten sub-cities of the capital, which has a population of 283,472 (Central Statistical Agency, Ethiopia 2012). The center is also in the vicinity of a large khat market as well as several khat houses.

Participants were Pro Pride clients, aged 18–49 years. This study was unable to include individuals younger than 18 years as they would not be able to provide written informed consent. We used a convenience sampling strategy to recruit participants. Specifically, all Pro Pride clients from November 2009–March 2010 were approached for enrollment into the study. To calculate sample size, we estimated khat use to be 20% in the general population. Therefore detecting an association between khat use and HIV status with an odds ratio of 2.5 would require 67 HIV positive and 201 HIV negative individuals for a total of 268 individuals. We collected data until we identified 50 HIV positive individuals. Onsite interviewers discussed the goals of the study, assessed eligibility of the individuals and if eligible, asked for written voluntary consent. Eligible participants were asked to complete a self-administered questionnaire. A total of 692 Pro Pride VCT were asked to participate in the study and 684 (98.8%) completed the self-administered questionnaire. Of these, the onsite interviewers conducted a face-to-face interview with 25 clients with limited literacy.

Questionnaire

Questionnaire content was informed by the exploratory phase of the study including formative research and pilot testing conducted with Pro Pride VCT clients (Berhanu et al., 2012). The survey took approximately 45 minutes to complete and included five main

topics: **1) Sexual Behavior:** participants who reported ever having sexual intercourse were asked about the number of sex partners in one's lifetime as well as number of sex partners 90 days prior to the interview. Specific information was collected on 5 most recent partners, including type of partner (primary, casual), number of sexual acts, and number of times condoms were used for each type of sexual act. Respondents with more than five partners were asked to summarize for the total additional number of sexual partners, number of sexual encounters and number of times condoms were used (NIMH Multisite HIV Prevention Trial, 1997). **2) Khat use:** participants categorized themselves as never, past (in their lifetime but not currently) or current users (used khat in the last 90 days). For past khat users, duration of use and time since cessation were collected. For current users, length of khat use, frequency (1–3 times a month, 1–3 times a week, 3–4 times a week, every day), type, and quantity (.5 bundle or less, 1–1.5 bundles, 2 or more bundles) used in the last 90 days were assessed. The survey also asked about perceived consequences of khat use (e.g., sexual arousal/encounters, alcohol consumption). Participants were asked about the frequency of using khat prior to a sexual encounter ("In general, with what frequency did you use khat before a sexual intercourse in the last 90 days?"). The questionnaire also collected data on the setting in which khat was used (e.g., alone vs. in the presence of another person/others) (Berhane & Worku, 2007). **3) Alcohol use:** frequency (1–3 times a month, 1–2 times a week, 3–4 times a week, everyday); amount, using the number of standard drinks as our measure, (less than 5 drinks, 5 or more drinks) (Berhane & Worku, 2007). **4) STI:** a history of self-reported ("Have you ever been infected with an STI?") and clinically diagnosed sexually transmitted infections ("Have you been told by a health care worker that you have an STI?") was collected. 5) **Socio-demographics:** questions on age, gender, occupation, schooling, marital status, and religious affiliation were included on the questionnaire. After responding to the questionnaire, participants received HIV pre-test and risk reduction counseling and underwent HIV antibody testing. Test results were provided by Pro Pride staff at the same visit, in the context of post-test counseling.

This study was approved by the institutional review board of Johns Hopkins University.

HIV testing

HIV serology was conducted at the Pro Pride VCT center using the KHB (Shanghi Kehua Bio-engineering Co. Ltd., China) rapid test for initial HIV testing. A KHB-positive result was validated using Stat-Pak (Chembio diagnostic System Inc, USA). UniGold (Trinity Biotech Ltd., Ireland) was used as a tie breaker for discordant test results. VCT centers in Ethiopia follow national guidelines (Federal HIV/AIDS prevention and control office, federal ministry of health, 2007). Study participants received HIV pre-test and risk reduction counseling prior to undergoing HIV antibody testing. Test results were provided to all participants at the same visit by Pro Pride staff, in the context of post-test counseling. HIV infected participants were referred to care.

Statistical Analysis

We conducted descriptive analyses of socio-demographic characteristics by current (use during the previous 90 days) khat use. Factors associated with current khat use were also assessed using bivariate and multivariable analyses. Based on the observed sample of 149

current khat users and 535 non-khat users, the statistical power to detect an odds ratio of 2.00 for most factors was approximately 80% with an associated two-sided significance level of 0.05.

Factors associated with khat use—A descriptive analysis of socio-demographic characteristics by current khat use status was conducted for the following variables: gender, age, religion, education, employment, alcohol use and number of sex partners in one's lifetime. We calculated proportions and assessed the association between covariates, and between each covariate and khat use, using Pearson's chi squared test. This was followed by bivariate analysis to calculate crude odds ratios estimating the association between each variable and khat use status. All variables that were statistically significantly associated (p<0.05) with khat use status in the bivariate analysis were included in the multivariable logistic regression analyses. We used a backwards stepwise approach to individually remove each variable that did not remain significantly associated (p<0.05) in the multivariable regression. We also conducted the Hosmer-Lemeshow test to assess goodness of fit test for the final adjusted model.

Among current khat users we also described the setting and frequency of use, age at khat use initiation and effect of khat on sexual desire and performance. For individuals who had used khat in their lifetime, but not in the past 90 days we assessed average length of cessation.

In addition, a descriptive analysis of khat use status by number of sexual partners in the previous 90 days and condom use in the previous 90 days was conducted for the subset of 211 individuals (30.8% of participants) who reported having had a sexual encounter in the specified time period.

Factors associated with HIV Status—To estimate the association between each characteristic with HIV status, we conducted a bivariate analysis to calculate crude odds ratios estimating the association between HIV status and the following variables: khat use, alcohol use, number of sex partners in one's lifetime, and socio-demographic characteristics. All variables that were significantly associated (p<0.05) with HIV status in the bivariate analysis were included in the multivariable logistic regression analyses. We used a backwards stepwise approach to individually remove each variable that did not remain significantly associated (p < 0.05) in the multivariable logistic regression. We also conducted the Hosmer-Lemeshow test to assess goodness of fit for the final adjusted model.

The Stata/SE 10.1 statistical analysis package was used for all analyses (College Station, TX).

RESULTS

Selected socio-demographic characteristics of the overall study population of 684 individuals are shown in the total column of Table 1. Females accounted for half (50.7%) of the participants and individuals aged 18–29 comprised 71.8% of the study population. The majority of participants were single (66.6%), 20.4% were married. A majority of participants were Christian (79.5%), with the remaining being Muslim (20.5%). Fifty-three

percent had a 9th grade education or higher and 54.2% were unemployed; of these, 44.7% were students.

Factors associated with khat use

A history of khat use was reported among 241 (35.2%; 55.8% of males and 15.3% of females) of 684 participants, with 21.8% (n =149) reporting current use and 13.4% (n=92) reporting past khat use. Among individuals who had past khat use but not current use, the median time since cessation was 24 months. For subsequent analyses, past and non-khat users were combined as current non-khat users.

Bivariate and multivariable analyses of factors associated with khat use are shown in Table 2. Although condom use in the past 90 days was significantly associated with khat use in Table 1, it is not included in Table 2 because we only have data on condom use on the subset of 211 (30.1%) individuals who reported having sex in the past 90 days. Through a backward stepwise process we constructed a final multivariable model that included gender, religion, alcohol and number of sex partners in one's lifetime. This model, relative to the full model (all variables that were associated with khat use in the bivariate analysis), had smaller AIC and BIC. The Hosmer-Lemeshow test had an associated p-value of 0.18, indicating that the final model fit the observed data well. After controlling for the other potential confounding variables, males had increased odds of current khat use as compared to females (aOR = 3.22, 95% CI = 1.82, 5.56). Current khat use was also significantly associated with being Muslim as compared to Christian (aOR = 6.07, 95% CI = 3.17, 11.62), having more than one sex partner in one's lifetime versus none or one (aOR of having four or more partners = 6.89, 95 % CI= 3.87, 12.25) and drinking alcohol as compared to non-drinkers (aOR = 8.77, 96% CI = 4.77, 16.15). Among khat users who drink alcohol, the primary reason for drinking was to relax (48.0%) and to "break the khat high" (26.0%). Number of sexual partners in the last 90 days was no longer statistically significant in the multivariable analysis since having a sexual partner in the last 90 days and number of sex partners in one's lifetime were observed to be highly correlated.

Current khat use primarily occurred at home (38.3%) or in khat/shisha houses (30.9%). Khat was used mainly with friends (75.2%). Prevalence of daily use was 33.6%. Twenty percent of current khat users reported that khat use improved their sexual desire, while 40.9% reported no effect. Thirty-eight percent reported that khat increased their sexual performance while 39.2% said their performance was unaffected (data not shown).

Khat use and sexual risk

Two hundred eleven (30.8%) study participants reported having had a sexual encounter in the 90 days preceding the study (Table 1). Of these, 15.2% reported having two or more partners in the previous 90 days. This proportion was higher among current khat users than current non-users (31% vs 7.1%). Approximately a third (29.4%) of participants reporting a sexual encounter in the preceding 90 days reported consistent condom use (most times/ always). Compared to current non-users, a greater proportion of current khat users reported consistent condom use in the previous 90 days (53.5% vs. 17.1%).

Factors associated with HIV status

Of the total study population (n = 684), 51 individuals tested positive for HIV (7.5%). Factors significantly associated with HIV status in bivariate and multivariable analysis are shown in Table 3. The number of sexual partners in the past 90 days was not associated with HIV status in bivariate analysis. The multivariable model was constructed using a backward stepwise process that initially included all statistically significant variables (p<0.05) from the bivariate analyses: gender, age, religion, marital status, employment, khat use and number of sex partners in one's lifetime. Through this stepwise process, we constructed a final multivariable model where all variables were significantly associated with being HIV-positive: age, marital status, employment, khat use and number of sexual partners in one's life time. Compared to the full model, the final model with fewer variables had smaller AIC and BIC. The p-value for the Hosmer-Lemeshow test was 0.43, indicating that the final model fit the observed data well.

After controlling for potential confounding variables, the odds of being HIV-positive were significantly increased among those who reported past khat use, but not in the past 90 days, as compared to individuals who had never used khat (aOR = 2.64, 95% CI = 1.13, 6.19); those who had two or three (aOR = 2.40, 95% CI = 1.11, 5.16) or four or more (aOR = 2.98, 95% CI = 1.16,7.63) number of sex partners in one's lifetime as compared to those with none or one; those who were divorced/ widowed (aOR=9.10, 95%CI= 3.79,21.89) as compared to those who were never married; those who were aged 30–39 years (aOR 2.75, 95% CI = 1.31, 5.79) as compared to those who were aged 8–29 years, and those who were employed (aOR 2.02, 95% CI = 1.01, 4.07) as compared to those who were unemployed. Although gender was statistically significant in the bivariate analysis, it was not significant in the multivariable analysis.

DISCUSSION

Overall, the proportion of individuals reporting current (22%) or past (13%) use of khat in this population of VCT attendees was comparable to previous research (Gebrehanna et al., 2014, Reda et al., 2012, Damena et al., 2011). Our study found that over half of male participants reported past khat use and that men had a greater odds of using khat compared to females, which has been shown in other studies. Khat use among females is restricted due to social and cultural norms (Gebrehanna et al., 2014; Halle & Lakew, 2015). Our finding that Muslims were more likely to currently use khat has also been shown in the literature and reflects a tradition of using khat for optimal concentration in prayer and work (Haile & Lakew, 2015). Khat users had a greater number of number of sex partners in one's lifetime, which may reflect a higher propensity for risk taking behaviors. In addition, participants who reported drinking alcohol were more likely to use khat and to use alcohol either for relaxing or breaking the khat high, a finding which echoes previous research in this area (Abebe et al., 2005, Alemu et al., 2007).

In our study, khat users were more likely to have had two or more partners in the previous 90 days, however less than one-third of individuals reported a sexual encounter in this time period. These results suggest higher risk for those who use khat but relatively low sexual risk overall. Interestingly, a greater proportion of current khat users reported consistent condom

use, which suggests that possibly high-risk individuals are recognizing their risk and acting to reduce it. Further, our study was conducted at a VCT where respondents may be more likely to provide socially desirable responses with respect to their condom use. Our participants' views on the relationship between khat use and sexual risk are also mixed; while approximately 20% felt that khat use increased sexual desire, 40% felt that it did not have an effect on sexual desire. This finding confirms our previous qualitative study (Berhanu et al., 2012), which found that while men's perceptions of the effect of khat use on sexual desire and performance varied, the belief that khat had either no or a negative effect on sexual performance was more common. However, contrary to this, men often reported drinking alcohol after using khat to increase their sexual performance. This practice may account for the association between khat use and increased number of sexual partners in the past 90 days.

Our study supports previously documented associations with HIV status in this East African context. Using khat in one's lifetime but not in the past 90 days, and number of sex partners in one's lifetime were associated with HIV-infection, which has been seen previously in this region (Landman et al., 2008). Past khat use represents cumulative risk of exposure and, thus, may be associated with increased risk for HIV where HIV prevalence also represents a cumulative rather than current risk. Indeed, past khat use and lifetime partners may be more relevant than current khat use and recent multiple partners for HIV infection.

Our study, like previous research in Ethiopia, found that having been married (Mekonnen et al., 2005) and older age (30–39) as compared to less than 30 (Bradley et al., 2006) are both associated with HIV infection. However, a similar association was not observed for individuals aged 40–49. The results of this study suggest that the complex mechanisms that underlie associations between HIV infection, age, widowhood and divorce merit additional investigation.

This study has several limitations that should be considered when interpreting results. First, information bias may have occurred during data collection. Self-reported behavioral data may have been reported erroneously due to recall bias or socially desirable responses for more sensitive questions. For example, young men (who are more likely to use khat), may be more likely to report sexual encounters than older men or women, given norms and expectations in this context (Molla et al., 2008). The use of a self-administered questionnaire and relatively short time frames for reporting behaviors (e.g., past 90 days) attempted to minimize these biases. Among the 25 individuals who were not literate and were therefore administered a face-to-face interview, specific techniques were used to minimize social desirability bias. Interviews were administered in a private room within the clinic and interviewers reiterated that there were no right or wrong answers prior to starting a survey section that was more sensitive in nature. In addition, interviewers were trained to frame questions to reduce stigma around risk behaviors using lead-ins such as: "Some individuals chew khat for a range of reasons, including to relax after work or to celebrate. Have you ever chewed khat?" Since participants responded to the survey prior to knowledge of their HIV status, any information misclassification that might have occurred is unlikely to be differential. Second, data on covariates and khat use or HIV status were collected simultaneously, and therefore temporality cannot be established. However cross-sectional

studies highlight important associations that can be further investigated in longitudinal studies. An additional limitation is that the Pro Pride VCT center is located in Merkato, which is in the city's commercial core. As a result the population Pro Pride serves might be different than the general population of Addis Ababa. In Ethiopia, however, individuals who have ever tested are significantly more likely to live in urban vs. rural settings which suggests that our population may offer insights, at a minimum, into the prevention needs of urban populations (Leta et al., 2012). Finally, this convenience sample was a consecutive sample of participants at a clinic, of whom the majority agreed to participate. Although our results are not generalizable to individuals outside of this setting, they do have internal validity.

In spite of these limitations, this study suggests that past khat use is associated with HIV status while current khat use is associated with other HIV risk behaviors, including current alcohol use and lifetime partners. In contexts where khat is used, clinicians should ask their patients about current or past khat use, and should counsel those that use khat about associations with HIV risk and encourage HIV testing. Further, our study suggests that khat use, alcohol use and sexual risk taking behavior may present a constellation of risk that merits the attention of users, practitioners and researchers.

Acknowledgments

References

Abebe D, Debella A, Dejene A, Degefa A, Abebe A, Urga K, Ketema L. Khat chewing habit as a possible risk behavior for HIV infection: A case-control study. Ethiopian Journal of Health Development. 2005; 19(3):174–181.

Alemu H, Mariam DH, Belay K, Davey G. Factors Predisposing out-of –school youths to HIV/AIDS-related risky sexual behavior in Northwest Ethiopia. Journal of Health Population and Nutrition. 2007; 3:344–350.

Balint E, Falkay G, Balint G. Khat-a controversial plant. Wien Klin Wochenschr (The middle European Journal of Medicine). 2009; 121:604–614.

Berhane Y, Worku A. Addis Continental Institute of Public Health. 2007. Alcohol and Khat consumption and the association with HIV/AIDS prevention, care and treatment in Ethiopia: Final report.

Berhanu D, Go VF, Ruff A, Celentano DD, Bishaw T. Khat use among HIV voluntary counselling and testing centre clients in Ethiopia. Culture, Health & Sexuality. 2012; 14(10):1197–1212.

Bradley H, Bedada A, Brahmbhatt H, Kidanu A, Gillesie D, Tsui A. Education attainment and HIV status among Ethiopian Voluntary Counseling and Testing Clients. AIDS and Behavior. 2006; 11(5): 736–742. [PubMed: 17082983]

Central Statistical Agency of Ethiopia. Population statistics abstract. 2012. Retrieved on August 25, 2016 from: http://www.csa.gov.et/images/documents/pdf_files/nationalstatisticsabstract/ 2011/2011%20population.pdf

Colzato LS, Sellaro R, Ruiz MJ, Sikora K, Hommel B. Acute khat use reduces response conflict in habitual users. Front Hum Neurosci 2013. 2013; 7:285.doi: 10.3389/fnhum.2013.00285

Damena T, Mossie A, Tesfaye M. Khat chewing and mental distress: a community based study, in jimma city, southwestern ethiopia. Ethiopian Journal of Health Sciences. 2011; 21(1):37–45. [PubMed: 22434984]

Dawit A, Debella A, Dejene A, Abebe A, Mekonnen Y, Degefa A, Urga K, Ketema L. Is khat-chewing associated with HIV risk behavior? A community-based study from Ethiopia. African Journal of AIDS Research. 2006; 5(1):61–69. [PubMed: 25875147]

Federal HIV/AIDS prevention and control office federal ministry of health. Guidelines for HIV counseling and testing in Ethiopia. 2007. Retrieved on January 25, 2011 from: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_125384.pdf

Gebissa E. Khat in the horn of Africa: Historical perspectives and current trends. Journal of Ethnopharmacology. 2010a; 132:607–614. [PubMed: 20227478]

Gebissa E. Taking the Place of Food: Khat in Ethiopia. Red Sea Press; 2010b.

Gebrehanna E1, Berhane Y, Worku A. Khat chewing among Ethiopian University Students--a growing concern. BMC Public Health. 2014; 21(14):1198.

Haile D, Lakew Y. Khat Chewing Practice and Associated Factors among Adults in Ethiopia: Further Analysis Using the 2011 Demographic and Health Survey. PLoS One. 2015; 10(6):e0130460. [PubMed: 26090658]

Kassim S, Al'absi M. Khat use is a neglected addictive behaviour. Addiction. 2015; doi: 10.1111/add.13148

Kebede D, Alem A, Mitke G, Enquselasssie F, Berhane F, Abebe Y, Ayele R, Lemma W, Assefa T, Gebremichael T. Khat and alcohol use and risky sex behavior among in-school and out-of-school youth in Ethiopia. BMC Public Health. 2005; 5:109. [PubMed: 16225665]

Landman KZ, Ostermann J, Crump JA, Mgonja A, Mayhood MK, Itemba DK, Tribble AC, Ndosi EM, Chu HY, Shao JF, Bartlett JA, Thielman NM. Gender Differences in the Risk of HIV Infection among Persons Reporting Abstinence, Monogamy, and Multiple Sexual Partners in Northern Tanzania. PLoS ONE. 2008; 3(8):e3075. [PubMed: 18728779]

Leta TH, Sandøy IF, Fylkesnes K. Factors affecting voluntary HIV counselling and testing among men in Ethiopia: a cross-sectional survey. BMC Public Health. 2012; 12:438. [PubMed: 22703550]

Mbulaiteye S, Ruberantwari A, Nakiyingi J, Carpenter L, Kamali A, Whitworth J. Alcohol and HIV: A study among sexually active adults in rural southwest Uganda. International Journal of Epidemiology. 2000; 29:911–915. [PubMed: 11034977]

Mekonnen Y, Sanders E, Messele T, Wolday D, Dorigo-Zestma W, Schaap A, Mekonnen W, Meless H, Mihret W, Fontanet A, Coutinho RA, Dukers NH. Prevalence and incidence of, and risk factors for, HIV-1 infection among factory workers in Ethiopia, 1997–2001. J Health Popul Nutr. 2005; 23(4):358–68. [PubMed: 16599107]

Menna T, Ali A, Worku A. Prevalence of "HIV/AIDS related" parental death and its association with sexual behavior of secondary school youth in Addis Ababa, Ethiopia: a cross sectional study. BMC Public Health. 2014; 14:1120. [PubMed: 25359693]

Molla M, Berhane Y, Lindtjørn B. Traditional values of virginity and sexual behavior in rural Ethiopian youth; results from a cross-sectional study. BMC Public Health. 2008; 8:9. [PubMed: 18184425]

Mulu W, Abera B. Sexual behaviours and associated factors among students at Bahir Dar University: a cross sectional study. Reproductive health. 2014; 11:84. [PubMed: 25481831]

NIMH Multisite HIV Prevention Trial. Demographic and behavioral predictors of sexual risk in the NIMH Multisite HIV Prevention Trial. AIDS. 1997; 11(Supplement 2):S21–S27.

Reda AA, Moges A, Biadgilign S, Wondmagegn BY. Prevalence and determinants of khat (Catha edulis) chewing among high school students in eastern Ethiopia: a cross-sectional study. PLoS One. 2012; 7(3)

Seme A, Hale MD, Worku A. The association between substance abuse and HIV infection among people visiting HIV counseling and testing centers in Addis Ababa, Ethiopia. Ethiopian Journal of Health Development. 2005; 19(2):116–125.

Soboka M, Tesfaye M, Feyissa GT, Hanlon C. Khat use in people living with HIV: a facility-based cross-sectional survey from South West Ethiopia. BMC Psychiatry. 2015; 15:69.doi: 10.1186/s12888-015-0446-5 [PubMed: 25879767]

Tadesse N, Ayele TA, Mengesha ZB, Alene KA. High prevalence of HIV/AIDS risky sexual behaviors among street youth in Gondar town: a community based cross sectional study. BMC Research Notes. 2013; 6:234. [PubMed: 23767966]

Taffa N, Bjune G, Sundby J, Gaustad P, Alestom A. Prevalence of gonococcal and chlamydial infection and risk behavior among youth in Addis Ababa, Ethiopia. Sexually Transmitted Diseases. 2002; 29(12):828–33. [PubMed: 12466727]

Tilahun M, Ayele G. Factors associated with age at first sexual initiation among youths in Gamo Gofa, south west Ethiopia: a cross sectional study. BMC Public Health. 2013; 13:622. [PubMed: 23819567]

UNAIDS. [Accessed December 1 2014] 2013. http://www.unaids.org/en/regionscountries/countries/ethiopia

UNAIDS. [Accessed December 1, 2014] 2014. http://www.unaids.org/en/resources/campaigns/2014/2014gapreport/gapreport/

UNAIDS. [accessed November 12, 2015] 2014. http://www.unaids.org/sites/default/files/country/documents/ETH_narrative_report_2014.pdf

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Socio-demographic characteristics of VCT center clients by current khat use, Addis Ababa 2010.

Characteristic (n.)	Total (n=684) No. (%)	Current Khat Users (n=149) No. (%)	Non-khat Users[a] (n=535) No. (%)	p-value [b]
Gender (684)				
Male	337 (49.3)	125 (83.9)	212 (39.6)	<0.001
Female	347 (50.7)	24 (16.1)	323 (60.4)	
Age (684)				
18–29	491 (71.8)	118 (79.2)	373 (69.7)	0.04
30–39	124 (18.1)	23 (15.4)	101 (18.9)	
40–49	69 (10.1)	8 (5.4)	61 (11.4)	
Religion (682)				
Christian	542 (79.5)	110 (73.8)	432 (81.0)	0.05
Muslim	140 (20.5)	39 (26.2)	101 (19.0)	
Marital Status (682)				
Never married	454 (66.6)	116 (78.4)	338 (63.3)	<0.01
Married	139 (20.4)	21 (14.2)	118 (22.1)	
Divorced/Widowed	89 (13.0)	11 (7.4)	78 (14.6)	
Years of Education (684)				
None	48 (7.0)	3 (2.0)	45 (8.4)	<0.001
Primary	272 (39.8)	40 (26.9)	232 (43.4)	
Secondary and above	364 (53.2)	106 (71.1)	258 (48.2)	
Employment (682)				
Unemployed	370 (54.2)	59 (39.9)	311 (58.2)	<0.001
Employed	312 (45.8)	89 (60.1)	223 (41.8)	
Alcohol use (684)				
Non drinkers	375 (54.8)	26 (17.5)	349 (65.2)	<0.001
Past	69 (10.1)	12 (8.1)	57 (10.7)	
Current	240 (35.1)	111 (74.5)	129 (24.1)	
Life time sexual partners (683)				
None or one	423 (61.9)	42 (28.2)	381 (71.4)	<0.001
Two to three	125 (18.3)	27 (18.1)	98 (18.3)	
Four or more	135 (19.8)	80 (53.7)	55 (10.3)	
Number of sexual partners in the last 90 days (684)				

Characteristic (n.)	Total (n=684) No. (%)	Current Khat Users (n=149) No. (%)	Non-khat Users[a] (n=535) No. (%)	p-value [b]
None or one	652 (95.3)	127 (85.2)	525 (98.1)	<0.001
Two or more	32 (4.7))	22 (14.8)	10 (1.9)	
Condom use in the last 90 days (211)[c]				
Sometimes/Rarely	149 (70.6)	33 (46.5)	116 (82.9)	<0.001
Most times/Always	62 (29.4)	38 (53.5)	24 (17.1)	

[a]Non-khat users category here included those that never chewed and those that chewed in the past

[b]Pearson's chi-squared test

[c]Data available for the 211 individuals that reported having one or more sexual encounters in the 90 preceding study participation

Table 2

Unadjusted and adjusted associations of different characteristics with current khat use among VCT center clients, Addis Ababa 2010.

Characteristic (n)	Unadjusted OR (95% CI)	p-value [a]	Adjusted [b] OR (95% CI) (n=681 [c])	p-value [d]
Gender (684)				
Female	1.00		1.00[e]	
Male	7.69 (5.00,12.50)	<0.001	3.22 (1.82, 5.55)	<0.001
Age (684)				
18–29	1.00		-- [f]	
30–39	0.72 (0.44,1.18)	0.20		
40–49	0.41 (0.19,0.89)	0.02		
Religion (682)				
Christian	1.00		1.00	
Muslims	1.52 (0.99, 2.32)	0.05	6.07 (3.17,11.62)	<0.001
Marital Status (682)				
Never married	1.00		-- [f]	
Married	0.52 (0.31,0.86)	0.01		
Divorced/Widowed	0.41 (0.21, 0.80)	<0.01		
Years of Education (684)				
None	1.00		-- [f]	
Primary	2.59 (0.77, 7.72)	0.13		
Secondary and above	6.16 (1.87, 20.27)	<0.01		
Employment (682)				
Unemployed	1.00		-- [f]	
Employed	2.10 (1.45, 3.05)	<0.001		
Alcohol use (684)				
Non drinkers	1.00		1.00	
Past	2.83 (1.35, 5.92)	<0.01	1.63 (0.70, 3.82)	0.26
Current	11.55 (7.20, 18.5)	<0.001	8.77 (4.77, 16.15)	<0.001
Life time sexual partners (683)				
None or one	1.00		1.00	
Two to three	2.50 (1.47,425)	<0.01	2.65 (1.42,4.94)	<0.01
Four or more	13.19 (8.26, 21.08)	<0.001	6.89 (3.87, 12.25)	<0.001

Characteristic (n)	Unadjusted OR (95% CI)	p-value [a]	Adjusted [b] OR (95% CI) (n=681 [c])	p-value [d]
Number of sexual partners in the last 90 days (684)				
None or one	1.00		-- [f]	
Two or more	9.09 (4.20,19.69)	<0.001		

[a] p-values for the bivariate logistic regression

[b] Adjusted for gender, religion, alcohol and life time sexual partners

[c] Data on three individuals were excluded due to missing values on religion and lifetime sexual partners

[d] p-values for the multivariable logistic regression

[e] 1.0 indicates the reference category in the logistic regression

[f] Variables that were no longer statistically significant in the final model

Table 3

Unadjusted and adjusted associations of different characteristics with HIV status among VCT center clients, Addis Ababa 2010.

Characteristic (n)	HIV Positives (n=51) No. (%)	HIV Negatives (n=633) No. (%)	Unadjusted OR (95% CI)	p-value [a]	Adjusted [b] OR (95% CI) (n=681) [c]	p-value [d]
Khat use (684)						
Non chewers	29 (56.9)	414 (65.4)	1.00		1.00	
Past	15 (29.4)	77 (12.2)	2.78 (1.42, 5.43)	<0.01	2.64 (1.13,6.19)	0.02
Current	7 (13.7)	142 (22.4)	0.70 (0.30, 1.64)	0.42	0.59 (0.21,1.61)	0.30
Gender (684)						
Male	15 (29.4)	322 (50.9)	1.0[e]		--[f]	
Female	36 (70.6)	311 (49.1)	2.48 (1.33, 4.63)	<0.01		
Age (684)						
18–29	19 (37.3)	472 (74.6)	1.0		1.00	
30–39	24 (47.1)	100 (15.8)	5.96 (3.15, 11.30)	<0.001	2.75 (1.31,5.79)	0.01
40–49	8 (15.7)	61 (9.6)	3.26 (1.37, 7.76)	<0.01	0.97 (0.35,2.64)	0.95
Religion (682)						
Christian	48 (94.1)	494 (78.3)	1.00		--[f]	
Muslim	3 (5.9)	137 (21.7)	0.23 (0.07, 0.73)	0.01		
Marital status (682)						
Never married	15 (29.4)	439 (69.6)	1.00		1.0	
Married	13 (25.5)	126 (20.0)	3.02 (1.40, 6.51)	<0.01	1.98 (0.80,4.92)	0.14
Divorced/Widowed	23 (45.1)	66 (10.4)	10.20 (5.06, 20.54)	<0.001	9.10 (3.79, 21.89)	<0.001
Years of education (684)						
None	1 (1.97)	47 (7.4)	1.00		--[f]	
Primary	36 (70.6)	236 (37.3)	7.17 (0.96, 53.59)	0.06		
Secondary and above	14 (27.4)	350 (55.3)	1.88 (0.24, 14.62)	0.55		

Characteristic (n)	HIV Positives (n=51) No. (%)	HIV Negatives (n=633) No. (%)	Unadjusted OR (95% CI)	p-value [a]	Adjusted [b] OR (95% CI) (n=681) [c]	p-value [d]
Employment (682)						
Unemployed	15 (29.4)	355 (56.3)	1.00		1.00	
Employed	36 (70.6)	276 (43.7)	3.09 (1.66, 5.75)	<0.001	2.02 (1.01,4.07)	0.05
Alcohol use (684)						
Non drinkers	25 (49.0)	350 (55.3)	1.0		--[f]	
Past	9 (17.7)	60 (9.5)	2.10 (0.93, 4.72)	0.07		
Current	17 (33.3)	223 (35.2)	1.07 (0.56, 2.02)	0.84		
Lifetime sexual partners (683)						
None or one	17 (33.3)	406 (64.2)	1.00		1.00	
Two to three	20 (39.2)	105 (16.6)	4.55 (2.30, 8.99)	<0.001	2.40 (1.11,5.16)	0.02
Four or more	14 (27.5)	121 (19.2)	2.76 (1.32, 5.77)	<0.01	2.98 (1.16,7.63)	0.02
Number of sexual partners in the last 90 days (684)						
None or one	49 (96.1)	603 (95.3)	1.00		--[f]	
Two or more	2 (3.9)	30 (4.7)	0.82 (0.19, 3.53)	0.79		

[a] p-values for the bivariate logistic regression

[b] Adjusted for marital status, khat use and life time sexual partners

[c] Data on three individuals were excluded due to missing values on marital status and lifetime sexual partners

[d] p-values for the multivariable logistic regression

[e] 1.0 indicates the reference category in the logistic regression

[f] Variables that were no longer statistically significant in the final model