

# Problematic Khat Use Among Prisoners in Debre Berhan Prison, Ethiopia: A Cross-Sectional Study

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## Research

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# Abstract

## Background

Cathine and cathinone which are the main psychostimulant components of khat, a green leaf chewed by many people in Yemen and East Africa for recreational purposes are controlled drugs by the UN, but khat chewing is legal in those countries. There are reports on the prevalence of khat use and its association with some health problems and alteration of behavior in communities of those countries. However, there is lack of evidence on the prevalence and associated factors of problematic khat use (PKU) among prisoners. This study aimed to assess the prevalence and associated factors of PKU among prisoners of Debre Berhan prison in Ethiopia.

## Methods

A cross-sectional study was conducted to assess history of PKU among prisoners before imprisonment at Debre Berhan prison. Randomly selected 347 prisoners were interviewed using Drug Abuse Screening Test (DAST) to screen for PKU in May 2017. Data were entered using Epi-Data version 3.1 and analyzed using Stata version 13 software. Bivariate and multivariable binary logistic regressions were conducted. Crude odds ratio and adjusted odds ratio (AOR), with 95% confidence interval (CI), are reported. Variables with p-value of < 0.05 were reported to be significantly associated with PKU.

## Results

About one-third (28.5%) of the prisoners had PKU before imprisonment. Factors significantly associated with increased odds of PKU included being non-Orthodox Christian in religion (AOR = 18.1; 95% CI= (3.8, 85.8)), infrequent visit to worship place irrespective of religion (AOR = 2.9; 95% CI= (1.1, 7.9)), being urban resident (AOR = 22.0; 95% CI= (7.7, 62.9)), perception that the current offence is related to using the substance (AOR = 6.0; 95% CI= (2.8, 12.8)), family history of substance use (AOR = 4.1; 95% CI= (1.2, 14.6)), and living alone before imprisonment (AOR = 3.55; 95% CI= (1.2, 10.7)). Whereas, being married was significantly associated with lower odds of PKU (AOR = 0.3; 95% CI= (0.0, 0.8)).

## Conclusion

Higher prevalence of PKU before imprisonment is reported in this population. In addition to other socio-demographic factors that showed association with use of the substance, current offence that led to imprisonment was also perceived as related to PKU. To prevent crime and health-related consequences of PKU in the community integrated action is recommended.

## Background

According to the World Health Organization (WHO) global burden of diseases 2010 report, mental and substance use disorders (SUD), are the leading cause of years of life lost due to disability [1]. Mental and SUD are among the top 10 causes of disability adjusted life years (DALYs) with 184 million DALYs; illicit drug use accounts for 10.9% of all DALYs [1]. According to a report by Balint et al (2009), an estimated 5–10 million people chew khat daily worldwide [2].

It is generally believed that the worldwide prison population is increasing in a rate faster than the population growth. Over the last 15 years the world population has increased by over 20%, whereas the world prison population increased by 25–30% [3]. As of the beginning of October 2013, more than 11 million people in the world were either in prison, in pre-trial, or in administrative detention. The same report showed that, in 2013, in Ethiopia there were about 112,361 prisoners [3].

Previous studies showed the positive association between crime and substance use [4–7]. In one of those studies [4], more than half of prisoners due to murder were abusing drug when they committed the crime; almost 50% of them were intoxicated at the time of committing the murder. This is supported through longitudinal data in the United States [5]. In addition, illicit drug use is associated with physical intimate partner violence [7]. A literature review by Poldrugo et al (1998) found strong relationship between substance use and criminal behavior [6]. In support of this, a study from Jimma prison, Ethiopia, reported that 10% of homicide offenders admitted that the homicide happened under the influence of substance [8]. People use substance to increase their confidence in committing crime, and this makes the condition more serious [9].

In comparison to studies in the general population, drug use was reported to be eight times more common among prisoners [10]. For any substance the prevalence ranges as low as 20.1% to as high as 95.5%. For drug use disorder (DUD), a prevalence ranging from 11.0–70.0% was reported [11–22]. Conversely, the prevalence of SUD before imprisonment is higher than both from use in prison and use in the general population implying that there is a relationship between crime and using substance. Studies have shown prevalence rate ranging from 50–88% for general substance, and 25%-73.8% for drug, before imprisonment [8, 9, 23–38].

A more recent systematic review of about 24 studies from 10 different countries reported a 30% pooled prevalence of DUD, which ranged from 10–61% among male prisoners [39]. Another systematic review reported a prevalence rate of drug dependence ranging from 10%-48% among male prisoners [40].

Overall, studies on the prevalence of SUD among prisoners in low and middle-income countries are very few. A systematic review of studies conducted worldwide by Fazel and colleagues (2017) [39], was able to find only two studies from low and middle-income countries. These studies reported a prevalence of 30% and 56% for DUD [39]. In Africa, studies which assessed the prevalence and associated factors of SUD among prisoners are lacking. We found a study from Kenya, which reported that 9.4% of prisoners use amphetamine, a substance having similar effect with khat, and 66.1% of prisoners had life time history of using substance [9].

Several factors were reported to be associated with substance use before imprisonment. These include younger age at the time of committing the offence, male sex, urban residence, higher educational status, presence of physical health problem, previous history of committing crime (property theft, rape, or fraud), seriousness of the crime, committing repeated offence, and presence of depression before imprisonment [9, 32, 41–44].

In Ethiopia different population-based studies showed that Khat chewing is prevalent [45–48]. On top of this, a case report from Amanuel Mental Specialized Hospital, Addis Ababa, Ethiopia, showed that heavy Khat chewing may have a potential to induce major mental disorders (such as psychosis), and aggravate criminality [49]. However, we only found two studies conducted among prison population in Ethiopia [8, 50]. The studies reported 44% of history of Khat use among homicide offenders [8], and 60% prevalence of Kat chewing among the general prisoners [50]. However, both of those studies were conducted in the same study site (Jimma town), which is a khat cultivating area unlike our study site (Debre Berhan town) where khat growing is not common. Therefore, this study aimed to assess the prevalence and associated factors of problematic khat use (PKU) among prisoners of Debre Berhan prison before imprisonment.

## Methods

The study was conducted in Debre Berhan prison in May 2017, using 347 randomly selected male prisoners imprisoned for less than five years. A cross-sectional study design was employed to conduct the study among male prisoners selected through a systematic random sampling method. The detailed description of the setting, and method of the study are reported elsewhere [51].

## Variables

The outcome variable of this study was problematic khat use (PKU), and explanatory variables were socio-demographic factors (such as age, marital status, educational status, residence, monthly income, etc), crime related factors (such as length of imprisonment, index offence, previous history of imprisonment, etc), and social factors (family history of substance use, satisfaction in life, living arrangement, etc).

## Measures

We used a structured questionnaire that we developed for the assessment of explanatory variables of this study. Detail description of measures used to assess the explanatory variables in this study are described elsewhere [51]. The measure used to assess the outcome variable (i.e., PKU) is described below.

## Assessment of problematic khat use

We assessed PKU using Drug Abuse Screening Test (DAST)-20, which has 20 items with yes/no response categories. The total score of DAST-20 ranges from 0 to 20. If a respondent scores above one, then he/she will be considered as a case for PKU [52]. At a cut-off point of two, DAST-20 has 95% sensitivity

and 68% specificity [53]. DAST has moderate to high test-retest reliability, inter-item and item-total correlation, validity, sensitivity, and specificity [53]. DAST-20 is easy to administer and has been used in diverse populations. We used DAST in our study because, there is no measure developed or adapted for assessing PKU, and previous published studies in Ethiopia used DAST to measure problematic khat use [50, 54].

## Data collection procedure

The questionnaire used to collect the outcome variable (i.e., PKU) was first prepared in English [52]. It was translated into Amharic, and back translated into English. The Amharic version of the questionnaire was used for the actual data collection. For the exposure variables, we developed and used a questionnaire in Amharic, the official language of the country and widely spoken in the study area.

We conducted a pre-test in 5% (n = 17) of the sample using people in Debre Berhan police custody and we made corrections on ambiguous items in our tool before the actual data collection. Five trained graduating class BSc nursing students collected data through a face to face interview. The interview was conducted in private area within the prison compound. A mental health professional supervised the data collection process.

## Data analysis

We used Epi-data version 3.1 for data entry, and Stata version 13 for data analysis. The clean row data are available and can be supplemented in commadelimited (\*.csv) dataset format, up on request. We used both bivariate and multivariable binary logistic regression analyses to identify factors associated with PKU. Both crude and adjusted odds ratio are reported. Variables with p-value < 0.005 are described as independently associated with PKU. We also conducted a reliability analysis and measure was taken, accordingly.

## Results

Three hundred forty-seven male prisoners with mean age of 27.8 years took part in the study. Nearly half of the participants had primary level of education, and were of rural by residence (48.1%, 51.6%, respectively). The median monthly income of the participants was 1500 Ethiopian Birr (ETB) (1 USD ≈ 23.09 ETB, during the period of data collection). Majority of the participants are Amhara by Ethnicity and Orthodox Christian by religion (93.4%, and 93.1%, respectively). Near half of the participants (52.7%) had stayed in prison for less than one year prior to our data collection, and more than one third of the participants (34.6%) reported that they committed the crime under the influence of substance. Family history of substance use was reported by 7.8% of the participants with khat chewing accounting for 63.0% of substances used in the family. One fifth (19.9%) of the participants used to live alone before imprisonment. Detailed description of the socio-demographic characteristics, social factors, and factors related to crime history of the participants are reported elsewhere [51].

## Reliability of DAST-20

Although the instrument we used to assess the outcome variable is a standard measure, we conducted internal consistency reliability analysis. We found that the Amharic version of DAST-20 had excellent internal consistency in our sample ( $\alpha = .931$ ). The Cronbach  $\alpha$  for DAST can be improved from .931 to .939 by deleting item 16 and 20. In those two items (item 16 and 20) their correlation with the total scale was about 0.2, however all other items had item-total correlation not less than 0.4. As a result, item 16 and 20 were removed from the final analysis.

## Prevalence of problematic khat use

At a cutoff point of two, 28.5 % ( $n = 99$ ) of the respondents had PKU before imprisonment. A higher proportion of those with PKU was in the low risk category, 38.4% ( $n = 38$ ) of cases (Table 1).

Table 1  
Prevalence and Severity of Problematic Khat Use

Variable	Response categories	Frequency (n = 347)	%
Problematic khat use	Yes	99	28.5
	No	248	71.5
Severity of problematic khat use	Low risk (2–5)	38	38.4
	Mild risk (6–10)	37	37.4
	Substantial risk (11–15)	20	20.2
	Severe risk (16+)	4	4.0

## Factors associated with problematic khat use

After controlling for the effects of potential confounding variables, our multivariable binary logistic regression analysis found the following variables to be significantly associated with PKU: being not-married, non-Orthodox Christian by religion, infrequent visit to worship places, urban residence, having family history of substance use, perception that the current offence is related to using substance, and living with friends before imprisonment (Table 2).

Table 2  
Sociodemographic, Personal, and Criminal Correlates of Problematic Khat Use

Variable	Response category	PKU caseness		COR (95% CI)	AOR (95% CI)
		No (%)	Yes (%)		
Age	≤ 20	66 (65.4)	35 (34.6)	1.0	1.0
	21–24	52 (68.4)	24 (31.6)	0.9 (0.5, 1.6)	0.9(0.4, 2.3)
	25–29	53 (69.7)	23 (30.3)	0.8 (0.4, 1.6)	0.8 (0.3, 2.4)
	≥ 30	77 (81.9)	17 (18.1)	<b>0.4 (0.2, 0.8)</b>	1.2 (0.4, 3.8)
Marital status	Unmarried*	139 (64.4)	77 (35.6)	1.0	1.0
	Married	109 (83.2)	22 (16.8)	<b>0.4 (0.2, 0.6)</b>	<b>0.3 (0.1, 0.7)</b>
Educational status	Unable to read & write	81 (87.1)	12 (12.9)	<b>0.4 (0.2, 0.8)</b>	0.6 (0.2, 1.9)
	Primary education	121 (72.5)	46 (27.5)	1.0	1.0
	Secondary education	37 (56.9)	28 (43.1)	<b>2.0 (1.1, 3.6)</b>	1.1 (0.5, 2.7)
	Tertiary and above	9 (40.9)	13 (59.1)	<b>3.8 (1.5, 9.5)</b>	1.9 (0.5, 7.0)
Ethnicity	Amhara	237 (73.2)	87 (26.8)	1.0	1.0
	Others **	11 (47.8)	12 (52.2)	<b>2.97 (1.3, 7.0)</b>	1.4 (0.4, 5.2)
Religion	Orthodox	242 (74.9)	81 (25.1)	1.0	1.0
	Other***	6 (25.0)	18 (75.0)	<b>8.96 (3.4, 23.4)</b>	<b>18.1 (3.8, 85.8)</b>
Frequency of worship	Daily	41 (61.2)	26 (38.8)	<b>3.0 (1.6, 5.7)</b>	1.5 (0.6, 3.8)
	2–3 times per week	26 (81.2)	6 (18.8)	1.08 (0.4, 2.9)	1.6 (0.4, 6.0)

\*Single, divorced, separated, and widowed. \*\*Oromo Tigray, Afar and Gurage. \*\*\* Protestant and Muslim. **Bold** is for variables with p-value of < 0.05

	One's a week	127 (82.5)	27 (17.5)	1.0	1.0
	Less than weekly	41 (67.2)	20 (32.8)	<b>2.3 (1.2, 4.5)</b>	<b>2.9 (1.1, 7.9)</b>
	Never	13 (39.4)	20 (60.6)	<b>7.2 (3.2, 16.3)</b>	<b>5.6 (1.6, 19.3)</b>
Residence	Urban	84 (50.0)	84 (50.0)	<b>10.9 (6.0, 20.1)</b>	<b>22.0 (7.7, 62.9)</b>
	Rural	164 (91.6)	15 (8.4)	1.0	1.0
Substance use reason for crime	Yes	58 (48.3)	62 (51.7)	<b>5.5 (3.3, 9.1)</b>	<b>6.0 (2.8, 12.8)</b>
	No	190 (83.7)	37 (16.3)	1.0	1.0
Childhood separation	Yes	45 (58.4)	32 (41.6)	<b>2.2 (1.3, 3.7)</b>	1.1 (0.4, 2.8)
	No	203 (75.2)	67 (24.8)	1.0	1.0
Childhood abuse	Yes	24 (60.0)	16 (40.0)	1.80 (0.9, 3.6)	0.8 (0.3, 2.5)
	No	224 (73.0)	83 (27.0)	1.0	1.0
Family history of substance use	Yes	11 (40.7)	16 (59.3)	<b>4.2 (1.8, 9.3)</b>	<b>4.1 (1.2, 14.6)</b>
	No	237 (74.1)	83 (25.9)	1.0	1.0
Living status	Alone	39 (56.5)	30 (43.5)	<b>3.19 (1.8, 5.7)</b>	0.8 (0.3, 1.8)
	With friend	14 (38.9)	22 (61.1)	<b>6.5 (3.1, 13.7)</b>	<b>3.6 (1.2, 10.7)</b>
	With family	195 (80.6)	47 (19.4)	1.0	1.0
Life satisfaction	Very poor	5 (38.5)	8 (61.5)	<b>5.2 (1.6, 17.0)</b>	1.8 (0.3, 10.7)
	Poor	23 (92.0)	2 (8.0)	0.3 (0.1, 1.3)	0.2 (0.0, 1.1)

\*Single, divorced, separated, and widowed. \*\*Oromo Tigray, Afar and Gurage. \*\*\* Protestant and Muslim. **Bold** is for variables with p-value of < 0.05

	Neutral	45 (77.6)	13 (22.4)	<b>0.9 (0.4, 2.0)</b>	0.8 (0.2, 1.1)
	Good	97 (76.4)	30 (23.6)	1.0	1.0
	Very good	78 (62.9)	46 (37.1)	<b>1.9 (1.1, 3.3)</b>	1.3 (0.6, 2.9)
Struggle to meet needs	Yes	37 (62.7)	22 (37.3)	1.6 (0.9, 2.9)	1.7 (0.6, 5.0)
	No	211 (73.3)	77 (26.7)	1.0	1.0
*Single, divorced, separated, and widowed. **Oromo Tigray, Afar and Gurage. *** Protestant and Muslim. <b>Bold</b> is for variables with p-value of < 0.05					

The odds of those who were married was less likely to have PKU compared to those who were unmarried (AOR = 0.3; 95% CI= (0.1, 0.8)). The odds of those who were followers of other religion than Orthodox Christianity was 18 times more likely to have PKU than those who were followers of Orthodox Christianity (AOR = 18.1; 95% CI= (3.8, 85.8)). Irrespective of the religious affiliation, the odds of those who visit worship places less often than weekly and those who never visit worship places were three times and six times more likely to have PKU compared to those who visit worship places once a week (AOR = 2.9; 95% CI= (1.1, 7.9), and AOR = 5.5; 95% CI= (1.6, 19.3), respectively).

The odds of those who were from urban areas was 22 times more likely to have PKU compared to those who were from rural areas (AOR = 22.0; 95% CI= (7.7, 62.9)). The odds of participants who perceived that their current offence is related to using khat or alcohol were six times more likely to have PKU compared to those who did not perceive that their current offence was related to khat or alcohol use (AOR = 6.0; 95% CI= (2.8, 12.8)). The odds of participants who reported a family history of substance use were four times more likely to have PKU than those who did not report family history of substance use (AOR = 4.1; 95% CI= (1.2, 14.6)). Finally, the odds of having PKU among those who live with friends before imprisonment were found to be nearly four times higher compared to those who live with their family (AOR = 3.55; 95% CI = 1.2, 10.7) (Table 2).

## Discussion

This study found that around one-third (28.5%) of the prisoners in Debre Berhan prison had PKU, before imprisonment. This is less than a prevalence reported from Jimma Prison studies which found that 44% and 60% of prisoners use Khat [8, 50]. The difference is probably due to one of those studies used of different instruments was conducted only among homicide offenders [8]. Also, those studies were conducted in Jimma, Jimma is a khat cultivating area where khat is easily available and commonly chewed. Generally, there is lack of research in the prison population to compare our results with. As a result, we compared with studies on DUD, which is more commonly researched among prisoners, and the instrument that we used to assess the prevalence of PKU is most commonly used for assessment of

DUD. Our finding is within the range of two systematic reviews conducted in 2006 and 2017, which reported prevalence range of 10–61% for DUD with pooled prevalence of 30%, and prevalence range of 10–48% [39, 40], respectively. Similarly, other studies reported a prevalence of DUD among prisoners to be 26% and 30% [10, 32]. The prevalence in our study is higher than a few other studies, which reported a prevalence of less than 14% [9, 22, 24]. On the other hand our finding is much lower than a prevalence report of one other study, in which the prevalence of DUD among male prisoners was 75% [33]. The difference might be because of use of different definitions for drug use (some reported only illegal drug use, others reported stimulant use, while in our study we assessed only the prevalence of PKU, a stimulant substance).

Our study found that prisoners who were married before impressment were less likely to have PKU compared to their unmarried counterparts. This finding is similar to a study which used national demographic and health survey data, and a general population study in Ethiopia [48, 55, 56]. Those studies reported positive association between being unmarried and Khat chewing. This finding indicates the protective effect of marriage against Khat use. People are more likely to feel responsible when they get married and cut or refrain from Khat use.

In this study religion is found to be significantly associated with PKU; the odds of prisoners who were followers of non-Orthodox religion were more likely to have PKU than Orthodox Christians. This again is consistent with a non-prison population study which found positive association between Muslim religion and khat use [46, 48, 55–58]. This is may be that khat is chewed as part of pray ceremony among the Muslim community in Ethiopia.

The positive significant association between PKU and urban residence in this study is also similar to previous studies which found that urban residence is significantly and positively associated with substance use [9]. This may be related to the availability of khat in urban areas more than in rural areas. Khat is not commonly grown in Debre Berhan area and therefore one need to have access to the khat market to buy and chew it.

Prisoners who perceived that their current offence is related to their habit of substance use were more likely to have PKU than those who did not perceive it as related to the offence. This is in line with a study from Jimma prison, which found that substance use and current offence were significantly associated [8]. Other previous studies have found that substance use has significant association with crime [6, 43]. Also, a case study in Ethiopia showed that heavy khat use has a potential to induce major mental disorder and lead to criminality [49].

The positive association between PKU and family history of substance use found in this study is consistent with other reports from community-based studies [57, 59]. This may implicate the genetic, and environmental predispositions for substance use.

We found that frequency of worship (irrespective of the religion) and living alone are significantly associated with PKU. This implies that lack of good social support, in terms of religious and personal life

increase the probability of PKU. However, since there are very limited studies on the association of these factors with PKU in the prison community, we were not able to compare our findings with other previous studies.

To our knowledge, this is one of the first studies to investigate the prevalence and associated factors of PKU in a prison population in Ethiopia using a standardized instrument. However, this study is not error free, and readers are recommended to consider the following limitations while interpreting the findings. Because of small number of women in Debre Berhan prison, we excluded female prisoners, and this may hamper generalizability of the findings especially among female prisoners. Since the items we included in our questionnaire asked about the habit of khat use and related behaviors before imprisonment, our study might be prone to a recall bias. We have tried to minimize this bias by excluding prisoners with more than five years of imprisonment. In addition, clear instruction and enough time to think were given to the participants before responding to the questions. The Amharic version of DAST is not validated in the Ethiopian prison context. To deal with the effect of this limitation we did a pre-test and measures were taken accordingly to improve the quality of the instrument. We also did internal consistency reliability analysis and we removed items with poor correlation with the total scale.

This study has implication to reduce PKU and prevent its adverse effects such as criminality. A collaborative action is needed among key stakeholders (police, the health sector, the youth office, and municipality) on the prevention and early treatment of PKU. The study also has implication for policy makers to think of the criminality dimension of the effect of substance use disorders while planning and designing substance control strategies. Since there is lack of research in the area in Ethiopia, this study can be considered as a steppingstone for future studies.

## **Conclusion**

This study found higher prevalence of PKU among prisoners before imprisonment. More than one third (34.6%) of the prisoners included in the study reported that they committed the current crime under the influence of Khat or Alcohol.

In addition to socio-demographic factors (such as religion, marital status, frequency of worshipping, frequency, and family history of chewing) that showed association with use of the substance, current offence that led to imprisonment was also perceived as related to PKU. As a result, we recommend collaborative actions among different stakeholders in establishing strategies to reduce harmful effect of khat use.

## **List Of Abbreviations**

AOR Adjusted odds ration

CI Confidence Interval

DALYs Disability adjusted life years

DAST Drug abuse screening test

DUD Drug use disorder

OR Odds ratio

PKU Problematic khat use

SUD Substance use disorder

WHO World health organization

YLDs Year's life lost because of disability

## **Declarations**

### **Ethics approval and consent to participate**

Ethical approval was obtained from the Ethical Review Committee of the College of Health Sciences, Debre Berhan University. Permission to conduct the research was obtained from respective prison offices. Informed verbal consent was obtained from each participant. Privacy and confidentiality were kept by replacing all names with codes and keeping all information in a locked bag.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

The data used for this study can be made available with reasonable request from the corresponding author.

### **Competing interest**

The authors declare that they have no conflict of interest.

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## Authors' contributions

KB and YG conceived and designed the study. YG and KB analyzed the data. YG, KB, A, KH, and AA drafted the manuscript. All the authors read the manuscript several times and have given final approval of this version to be published.

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