

Prevalence of *Catha edulis* (Khat) Chewing and Its Associated Factors among Ataye Secondary School Students in Northern Shoa, Ethiopia

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Abstract

The life time and current prevalence of khat chewing are 15.36% (95% CI; 11.7, 19.8) and 13.25% (95% CI; 11.0, 18.1) respectively. Multivariable logistic regression model revealed that male students [Adjusted OR = 2.15 (95% CI; 1.02, 4.56)], presence of chewer friends [Adjusted OR = 3.14 (95% CI; 1.53, 6.41)], having chewer family [Adjusted OR = 2.68 (95% CI; 1.13, 6.37)] and place of residency [Adjusted OR = 1.89 (95% CI; 1.0, 3.79)] were associated risk factors for khat chewing. Khat chewing is prevalent among students who are male, urban residents and students who have chewer friends and family. Therefore, to reduce the prevalence, social, economic and health effect of khat chewing, Minister of Education in collaboration with Ministry of Health has to work to incorporate life skill training in high school students' curricula.

Keywords

Ataye, Cathinone, Khat, Northern Shoa and Prevalence

1. Introduction

Catha edulis (khat) plant is an evergreen tree of family *Celastraceae*. The leaves of khat contain alkaloids structurally related to amphetamine. Khat is extensively cultivated in the highlands of Ethiopia (Reda et al., 2012) and surrounding countries like Kenya, Yemen and other African countries (Deressa & Azazh, 2011; Lemessa, 2001).

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The bud of khat contains the chemical called cathinone and cathine. Cathinone is more lipids soluble than cathine and it can easily cross the brain blood barrier (BBB) and enter in the central nervous system that is responsible for adverse effect on the body. Similarly, it has amphetamine like structure and causes similar effect on the body (Dawit & Asfaw, 2005). Khat is chewed daily by a high proportion of adult population for its Central Nervous System stimulant effect (Hussein, 2009). Furthermore, it is widely masticated among youth Ethiopians, especially high school, college and university students (Damena et al., 2011). Its effects on the chewers include increased levels of energy, increased self-esteem, euphoria, increased libido, excitement, and increased proclivity for social interaction (Deressa & Azazh, 2011; Oshodi et al., 2010). Even though khat chewing has addictive and negative physical, economical and social connotation effects, it has positive economic, social and medicinal values (Lemessa, 2001). In Ethiopia, khat is commonly used for stimulation and social recreation. Students are frequent users of khat before examination to have concentration, thereby to improve mental performance (EPHA, 2012; Kennedy et al., 1983; Hussein, 2009).

Many studies in Africa and outside reveal that the life time prevalence and current prevalence of khat chewing in high school, college and university students vary from place to place. These could be explained as in Kenyan high school the prevalence was 3.2% (Ndetei et al., 2010), 24.2% (95% CI; 22.2% - 26.2%) in Eastern Ethiopia high schools (Reda, 2012), 21.4% in Jazan high school (Hussien, 2009), 23.1% in higher education of Jazan region of Saudi Arabia (Reshad, 2013) and 10.9% in Dire Dawa high school (Ethiopia) (Negussie et al., 2014). Moreover, the prevalence increases as we go from high school to college and university students. A research done in Bahir Dar College showed that the prevalence of khat chewing was 19.6% (Mulugeta, 2013). Research conducted by (Kebede, 2002) in North West Ethiopia colleges showed that life time prevalence was 26.7% and current prevalence was 17.5%. On the hand, the prevalence of khat chewing in different universities of Ethiopia was indicated in researches conducted by different investigators, for instance, 28.7% by (Gebresilassie et al., 2013), 7.8% by (Aklog et al., 2013), 14.1% by (Deressa & Azazh, 2011) and 30.3% by (Derese & Seme, 2014). The above mentioned investigators findings depicted that there were many factors associated with khat chewing among students. Of which, most studies (Deressa & Azazh, 2011; Oshodi et al., 2010; Kebede et al., 2005; EPHA, 2006) showed that being male, having peers who chewed khat, having family members who chewed khat, residence place, religion and seniority in the case of college/university students were statistically significant.

Khat chewing nowadays has become an epidemic over East Africa especially in Ethiopia, Somali and southern Arab from the old to young, male and female, urban and rural settings (Getahun et al., 2010). Moreover, many adolescents have low knowledge towards adverse effects of khat chewing as indicated in literature (Oshodi et al., 2010). Though khat chewing has become a common practice among high school, college and university students in Ethiopia, few studies have assessed the prevalence and associated factors. Although there was a murmur of khat chewing among high school students in Ataye high and preparatory school, the magnitude and associated factors were not yet investigated. Therefore, the intent of this study was to establish the prevalence of khat chewing and associated factors among Ataye high school students and preparatory school students.

2. Methods and Materials

2.1. Study Area and Design

Cross sectional study design was applied among Ataye high school students in May 2014. Ataye district is one of the 22 districts found in Northern Shoa around 280 KM away from the capital of Ethiopia, comprising a total population of 125,914 (ADHO, 2014). In the district, there are one preparatory and one high school. These schools enrolled a total of 2000 students (Male = 1025 and Female = 975) from Grade 9 - 12. Students who were attending preparatory and high school from Grade 9 to 12 were included in the study while students who were very sick were excluded from the study.

Single proportion (adjusted formula) was used, taking prevalence 24.2% (Reda et al., 2012), 10% of non-respondent rate and due to multistage nature of sampling technique 1.5 design effect was used. The marginal error was taken as 5% with 95% confidence level. Multistage sampling technique was used to select a representative sample of 378 students.

Out of 38 sections (Grade 9 composed of 19 sections, Grade 10 composed of 10 sections, Grade 11 composed of 5 sections and Grade 12 composed of 4 sections), 8 sections were selected as a primary sampling units (PSU). Accordingly, from Grade 9 four sections, from Grade 10 two sections, from Grade 11 one section and from Grade 12 one section were selected by using lottery methods. To select study units from each sections systemat-

ic random sampling was used.

2.2. Study Variable Measurements

Two categories of variables were used in this study. The dependent variable was khat chewing status of the students. Ever chewed was defined as a student who had ever tried chewed khat in the past, even once. Current chewer was defined as a student who had chewed khat on one or more days in the preceding month (30 days) of the survey. The former is said to be life time prevalence, whereas the latter one is current prevalence rate. Independent variables were; age, sex, grade, residential area, having family/peer/relative chewers, religion and others.

2.3. Data Collection Procedure

The English version of self administered structured questionnaire was developed by the investigators adapting from literatures. Then it was translated to Amharic language which is the official working language of the study area (Ethiopia). The consistency of the translation from English to Amharic was checked by English teachers in Ataye preparatory and high schools. Ahead of data collection 7 peoples were recruited from Ataye District Hospital for data collection. Of whom 3 were BSc nurses and 3 were BSc supportive staffs and the one was supportive supervisor. To keep the quality of data, data collectors and supervisor were given training for one day regarding necessary explanations about the research and how to answer for any questions that arise from the respondents. Pre-test was done on 16 students who were not included in the study.

2.4. Data Processing and Analysis

Data were cleaned, coded and entered into Epi Info software version 3.5.1. Then these data were exported to SPSS version 16.0 for analysis. Descriptive statistics such as frequency, percentage, mean, standard deviation were calculated for some variables. Data presentation was done using frequency distribution tables. Generalized linear model (GLM) called logistic regression was used to identify factors affecting khat chewing behavior of students. Coefficients of binary logistic regression were estimated by Wald statistics. Odds ratio [expo (β)] of logistic regression coefficients indicate the chance of increasing (OR > 1) or decreasing (OR < 1) of khat chewing when treated with different explanatory variables. The cutoff point for bivariable logistic regression was declared at $p < 0.2$ to include variables in multivariate logistic regression. Statistical significance is confirmed at p value less than 0.05.

3. Result

3.1. Socio-Demographic Characteristics of the Respondents

Three hundred and seventy eight students were planned to be recruited in this study. But three hundred and thirty two students returned questionnaires giving a response rate of 88%. The percentage of male students was 53.6%. The majority (88.25%) of the respondents was found in age group between 12 - 18 years. while the mean age (Mean \pm SD) was 17.21 ± 1.42 (Table 1).

3.2. Socio-Demographic Characteristics of Current Khat Chewers

The life time and current prevalence rate of khat chewing were 15.36% at 95% CI (11.7, 19.8) and 13.25% at 95% CI (11.02, 18.01) respectively. Out of the 51 chewers more than half 24 (54.54%) of them started khat chewing at Grade 8. On the other hand out of forty-four who currently chew khat 38 (86.36%) were in the age group between 12 and 18, and 75% were male students, 68.18% were orthodox Christian, followed by Muslim 27.27%. As regards the residential place of the chewers 29 (65.9%) of chewers reside in urban (Table 1).

Out of the current chewers, nearly half of them 21(47.7%) chew khat once in a month. More than half 23 (52.9%) get khat from nearby shop. Others get form coffee house and street market. The main reasons were recreational 19 (43.2%) and 15 (34.1%) for studying purpose. Nearly one third of the students 16 (36.4%) believed that khat chewing has no effect on educational result. Moreover, the same amount of students believes that khat chewing decrease educational performance. About 18 (40.1%) of the chewer get money from their family and more than half 29 (65.9%) used nothing during and after khat chewing and only 8 (18.2%) of chewers used alcohol after chewing. Most of the parents 20 (45.5%) of the students were unresponsive towards the khat chewing

Table 1. Socio-demographic characteristics of current khat chewers and non-chewer students of Ataye high and preparatory school in May 2014 (N = 332).

Variables	N = 332	Frequency		Percent	95% CI
		Chewers	Non-Chewers		
		Frequency	Percent	Frequency	Percent
Life Time Chewers		51		15.40	11.7 - 19.8
Current Chewers		44		13.25	11.0 - 18.1
Age					
Between 12 and 18	293 (88.25%)	38	11.44	255	76.80
Between 19 and 28	39 (11.75%)	6	1.81	33	9.94
Sex					
Male	178 (53.61%)	33	9.94	145	43.67
Female	154 (46.39%)	11	3.31	143	43.07
Level of Grade					
Grade 9	166 (34.94%)	13	3.91	103	31.02
Grade 10	72 (21.68%)	12	3.61	60	18.07
Grade 11	79 (23.79%)	6	1.81	73	21.98
Grade 12	65 (19.58%)	13	3.91	52	15.66
Religion					
Orthodox	291 (87.65%)	30	9.03	261	78.61
Muslim	31 (9.34%)	12	3.61	19	5.72
Protestant	10 (3.01%)	2	0.60	8	2.41
Residence					
Urban	165 (49.69%)	29	8.73	136	40.96
Rural	167 (50.31%)	15	4.52	152	45.78
With Khat Chewers					
Alone	103 (31.02%)	15	4.52	88	26.5
Family	199 (59.94%)	22	6.63	177	53.31
Friend	30 (9.04%)	7	2.11	23	6.93

practice of their children. But sixteen parents disagree for their children khat chewing habit. From the current khat chewers 36 (81.8%) chew khat with their friends. Considering the side effects of khat, more than half 27 (61.36%) of current chewers promised to stop khat chewing practice in the future (**Table 2**).

3.3. Bivariate and Multivariate Analysis

Multivariate analysis was employed to assess the net effect of socio-demographic, explanatory variables on khat chewing. The result of binary logistic regression model revealed that respondents sex, place of residence and having chewer friends significantly associated with khat chewing. Sex was found to be one of the associated factors for khat chewing among Ataye preparatory and high school students. Male students were 2 times more likely to chew khat than female students [Adjusted OR = 2.15, 95% CI = (1.02, 4.56)]. Student's residential place was found significant with khat chewing. Those students who come from urban area were almost 2 times more likely to chew khat than students from rural areas [Adjusted OR = 1.89, 95% CI = (0.95, 3.79)]. Having chewer friend was one of the factors which associated with khat chewing. Those students who have chewer friends were chewed khat about 3 times more likely than their counterpart [Adjusted OR = 3.14, 95% CI = (1.53, 6.41)]. Besides, students who have chewer family were chewed khat 2.68 times more than those students who did not have family who chew khat [Adjusted OR = 2.68, 95% CI = (1.13, 6.37)]. Contrary, grade level of students was statistically significant in the binary (crude) analysis but not when adjusted for other variables in the model. In this study religion, category of age, having khat chewer relatives and living either with family or alone have no association with khat chewing (**Table 3**).

4. Discussion

This study tried to investigate the prevalence and associated risk factors of high school and preparatory school students in Ataye town. The scope was limited to Ataye high and preparatory school, so that this may be the potential limitation of the study. Moreover, the findings of this study may not be necessarily applicable to out-of-school adolescents where the use of khat might be higher. Even if the respondent rate was satisfactory (88%), based on these data findings the following explanation was made.

Table 2. Experience of current khat chewers among students of Ataye high and preparatory school in May 2014 (N = 332).

Variables	Frequency	Percent (%)
How many times did u chew khat?		
Daily	4	9.1
Twice a week	13	29.5
Once a week	6	13.6
Once a month	21	47.7
Where do you get khat for chewing?		
From nearby shop	23	52.3
From street peddlers	14	31.8
From coffee/restaurant house	7	15.9
What is the common reason for khat chewing?		
Recreational	19	43.2
Studying	15	34.1
Praying	2	4.5
Stress relieve	8	18.2
What was your family response for your khat chewing practice?		
Agree	8	18.2
Disagree	16	36.4
Indifferent	20	45.5
What do you think the influence of khat chewing on education?		
Increase educational performance	12	27.3
Decrease educational performance	16	36.4
No effect on educational performance	16	36.4
Common source of money to buy khat?		
Family	18	40.9
Friends	9	20.5
Relatives	4	9.1
My income	13	29.5
Commonly with whom did you chew khat?		
Alone	4	9.1
Family	4	9.1
Friends	36	81.8
Where did you commonly chew khat?		
At school	3	6.8
At home	9	20.5
At coffee house	15	34.1
In a separate place	17	38.6
What did you used after chewing khat?		
Alcohol	8	18.2
Cigarette	5	11.4
Shisha (Hookah)	2	4.5
Nothing	29	65.9

This study revealed that the life time and current prevalence rate of khat chewing among students were 15.36% and 13.25 respectively. The findings of this study give the impression to be lower than studies conducted in other parts of the country. A study from Eastern Ethiopia (Nigussie et al., 2014) revealed that the prevalence of khat chewing among high school students to be 18.4%. Similarly a survey conducted among high school students in Eastern Ethiopia (Reda et al., 2012) showed that the prevalence was 24.2%. (Kebede, 2002) conducted a research in four colleges found in North West Ethiopia publicized that the life time and current prevalence of khat chewing was 26.7% and 17.5% respectively. Likewise, study conducted by (Mulugeta, 2013) among college students in Bahir Dar town indicated that the overall prevalence of chewing was 19.6%. Khat chewing was found in different universities of Ethiopia in higher prevalence of the following areas; 28.7% in Axum University (Gebreselassie et al., 2013) and 30.3% in Haramaya University (Derese & Seme, 2014). Generally, the life time pooled and current pooled prevalence of khat in Ethiopia was 20% and 28.3% respectively (Bitew & Tefera, 2014). In a similar fashion, study conducted in Jazan region of Soudi Arabia College and high school (Hussien, 2009), the prevalence in high school was 21.5%. Besides, (Alsanosy et al., 2013) estimated that the prevalence was 20.5% in Jazan. Furthermore, Rashad and his colleagues (2013) reported that the prevalence of khat chewing among higher education in Jazan region of soudi Arabia was 23.1%. Contrary to our study, study conducted in Kenya high school (Ndetie et al., 2010) showed the prevalence of khat chewing was minimal

Table 3. Bivariate and multivariate regression model estimates of risk factors for khat chewing among Ataye high and preparatory school students in North Shoa, Ethiopia 2014.

Explanatory Variables	Khat Chewing Status		COR (95% CI)	AOR (95% CI)
	YES [No. (%)]	NO [No. (%)]		
Age Category				
12 - 18	38 (11.45%)	255 (78.38%)	1.22 (0.48, 3.11)	
19 - 28	6 (5.25%)	33 (9.9%)	1	
Sex				
Male	33(9.9%)	145 (43.67%)	2.96 (1.44, 6.08)	2.15 (1.02, 4.56)
Female	11(3.3%)	143 (43.1%)	1	1
Place of Residence				
Urban	29 (8.73%)	136 (40.96%)	2.16 (1.11, 4.20)	1.89 (0.95, 3.79)
Rural	15 (4.52%)	152 (45.78%)	1	1
Grade Level				
9th	13 (3.92%)	103 (31.02%)	1.98 (0.86, 4.58)	
10th	12 (3.61%)	60 (18.07%)	1.25 (0.53, 2.97)	
11th	6 (1.80%)	73 (21.89%)	3.04 (1.08, 8.52)	
12th	13 (3.92%)	52 (15.66%)	1	
Family Chew Khat				
Yes	10 (3.01%)	25 (7.53%)	3.09 (1.37, 6.99)	2.68 (1.13, 6.37)
No	34 (10.24%)	263 (79.22%)	1	1
Peer Chew Khat				
Yes	31 (9.34%)	118 (35.54%)	3.44 (1.73, 6.84)	3.14 (1.53, 6.41)
No	13 (3.91%)	170 (51.20%)	1	1
Relatives Chew Khat				
Yes	7 (2.11%)	54 (16.26%)	1.22 (0.52, 2.88)	
No	37 (11.14)	234 (70.48%)	1	
Students Live with				
Alone	15 (4.52%)	88 (26.50%)	1.78 (0.65, 4.89)	
With family	22 (6.63%)	177 (53.31%)	2.45 (0.94, 6.36)	
With peers	7 (2.11%)	23 (6.93%)	1	

3.2% as compared to our finding. These differences could be as a result of cultural variations among study population, difference in the characteristics of sampled population, status of understanding about the effects of *Catha edulis*, availability of khat and some geographical difference among study areas could be mentioned.

To appreciate the effect of time on behavioral change, we compared our findings with study from southwestern Ethiopia (Adugna et al., 1994) found that the prevalence of Khat chewing among upper secondary school students was 64.9%. A survey conducted in a rural community in southern Ethiopia establishes a prevalence of 50% (Alem et al., 1999). In addition, study conducted in Somalia reported that approximately 36.4% of the respondents had chewed Khat in the week preceding the interview (Odenwald et al., 2007). The difference may be stimulated by studies were conducted many years back, rules and regulation enforcement differences. Another study done in Addis Ababa among undergraduate medical students showed life time prevalence of 7% and current prevalence of 4% (Deressa & Azazh, 2011) and study done in Ayder medical school in Mekelle revealed that the life time prevalence 11.8% and current prevalence was 3.8% (Awoke et al., 2011). But, our finding life time prevalence 15.36% and current prevalence 13.25% which is higher than these two studies. The difference may be the chewers in former studies were at above adolescent age range. The age range in Addis Ababa undergraduate medical school was 20 - 24 (62%) and in Mekelle health science collage the age range was 21 - 25 (56%) (Deressa & Azazh, 2011; Awoke et al., 2011) compared to our finding, only 20.5% of students were above 20 years of age. This may show that early and middle adolescent students highly influenced by their environment and has the ambition of doing new things than late adolescent students (Abebe et al., 2005). Furthermore, those researches were done on students who were attending health related course at medical school where khat chewing is not a common practice. Besides, students in our study live with their families or friends where chewing khat is considered as normal. But, Students in Ayder Health Science College lives inside the campus where chewing khat is lawfully forbidden and punishable.

One of the determinant factors that affect the chewing practice of students was gender. In our study male stu-

dents currently chewed khat more than female students (**Table 3**). Similar differences were reported in a surveys carried out in different parts of Ethiopia and other world (Aklog et al., 2013; Negussie et al., 2014; Derese & Seme, 2014; Tilahun & Ayele, 2014; Mulugeta, 2013; Kebede, 2001; Reda et al., 2012; Gebreslassie, 2013; Abrha, 2013; Otiemo & Ofulla, 2009; Alsanosy & Mutwakel, 2013; Hussien, 2009). This significant difference may be due to the cultural acceptance of male practicing unusual things including khat chewing, alcohol and other substances than females in Ethiopia and it is not an exceptional in our study area.

Other significant factors identified in this study were (**Table 3**) having friends chewing khat having family using khat and place of residence. These predictors were statistically significant and determine khat chewing practice among Ataye high and preparatory students. Basically, this finding agrees with other studies done by different investigators (Gebreslassie et al., 2013; Abrha, 2013; Otiemo & Ofulla, 2009; Alsanosy & Mutwakel, 2013; Mulugeta, 2013; Kebede, 2001; Negussie et al., 2014; Aklog et al., 2013; Hussien, 2009). This is because: in the first place, youths directly persuade their friends to conform to their behavior; therefore khat chewers encourage their inexperienced peers to chew khat (Al-Mugahed, 2008); in the second place, since families were significant others (model/figures) of their sons, students with parental model (parents used khat) were more prone to khat chewing than their counter parts; thirdly, higher proportion of the students in this study were come from rural area that has no previous history of khat chewing as they lived with their family. In addition to rural areas khat chewing is not a common habit, students from the rural area are under the control of their family.

5. Conclusion and Recommendation

Mastication of khat among high and preparatory school students is prevalent and unacceptable in magnitude. Major factors that affect khat chewing were being male, peer influence, similar habit among family members and residential place. Therefore, to reduce the prevalence, social, economic and health effect of khat chewing, Minister of Education in collaboration with Ministry of Health has to work to incorporate life skill training in high school students' curricula. Moreover, open discussion system should be established to create an understanding on the ill effects of khat thereby to bring behavioral change. Not only that, schools also need to establish and strengthen teaching and monitoring system of their students through mass media (Local FM Radio) with special focus on khat control mechanism in collaboration with Ministry of Health, local administration and merchants who buy and sell khat. Last but not least, legal rule and regulations are recommended towards the cultivation, use and sell of khat.

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Abbreviation and Acronyms

ADHO	Ataye District Health office;
BBB	Brain Blood Barrier;
BSc	Bachelor of Science;
CI	Confidence Interval;
COR	Crude Odd Ratio;
EPHA	Ethiopian Public Health association;
GLM	Generalized Linear Model;
OR	Odd Ratio;
PSU	Primary Sampling Unit;
SD	Standard Deviation;
SPSS	Statistical Package for Social Sciences;
WHO	World Health Organization.

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