



**Socio-economic and Perceived Health Effects of Khat Chewing among
Persons aged 10-65 years in Selected Counties in Kenya**

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OPERATIONAL DEFINITIONS

1. **Lifetime prevalence of chewing:** the proportion of the study population who had ever chewed khat in their lifetime.
2. **Current prevalence of chewing:** The proportion of the study population who were chewing khat during the duration of study.
3. **Ever chewer:** An individual is considered an ever chewer even if he/she had chewed only once in his/her lifetime.
4. **Khat:** *Miraa* and *Muguka*

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EXECUTIVE SUMMARY

Miraa, qat, chat, cat, ghat or khat (*Catha edulis*), is a shrub indigenous to Eastern Africa and Arabic countries. Chewed *miraa* has sympathomimetic and euphoric effects and its chewing is a popular habit among various populations in Kenya. *Miraa* (*Catha edulis forsk*) contains a psychoactive substance called cathinone, which produces central stimulation analogous to amphetamine. Habitual use of khat renders certain influence on the physical, psychological and economic well being of the community. Fresh concerns have been raised about the social and economic impacts of khat consumption among Kenyans. The main objective of this study was to determine the socioeconomic and perceived health effects of *miraa* chewing among persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties. A cross-sectional survey using in-depth key informant interviews, focus group discussions, and structured pre-tested questionnaires was carried out.

A total of 979 respondents were interviewed, five key informant interviews and four focus group discussions done. Out of the respondents surveyed, males constituted 66.3% and females (33.7%). Christians (73.1%) were the majority followed by Muslims (26.5%) and other religious affiliations (0.4%). Majority (28.1%) of the participants in the surveyed counties were within the age group 26-35 years followed by 10-17 years (25.2%), and 18-25 years (19.8%). Approximately 97% of the study participants had attained at least primary level of education. Most (67.2%) of the respondents in this study were married. Overall, business was reported as the main source of income for the studied population although most (76.3%) of the respondents from Embu County were farmers. The mean monthly income for the study participants was Ksh 10,687.00. More than three quarters (87.6%) of the respondents earned less than Ksh. 20,000.00. Over ninety percent of the respondents were aware of both *muguka* (93.7%) and *miraa* (96.8%). Majority (61.0%) had got the information from friends while others got it from parents 18.5%, relatives 16.5%, media 2.5% and others 1.5%. Slightly above two thirds (67.3%) of respondents considered chewing of *miraa* a bad and unfashionable habit while 32.7% thought it was good and fashionable and a sign of good societal status. More than half (57.3%) of the respondents strongly agreed that *miraa* was addictive, while

48.2% and 48.7% reported that *miraa* causes both health and physical problems to most people considered *miraa* as drug.

Overall 47.1% of the study respondents reported to have ever chewed khat in their lifetime while the prevalence of current chewing in the population studied was 29.9%. Prevalence was high in Nairobi (32.6%) and Mombasa (37.2%) compared to Embu (21.5%) and (7.0%) Nyeri. Among those in school or college 21.6% and 14.3% had ever chewed *miraa* or *muguka* respectively. The proportion of males (89.1%) chewing khat during the duration of the study was significantly ($X^2 = 14.57$, $p < 0.0001$) higher than females (10.9%). Among the respondents aged 10-17 years khat chewing was significantly higher among the Nairobi County respondents than in the other areas. About 46% of the respondents had ever chewed *miraa* while 40.2% had ever chewed *muguka*. Of those who chewed khat, 50.8% had a family member who chews khat. Those who introduced chewers to the habit included parents (13.6%), relatives (14.6%), schoolmates (8.7%) and friends (62.9%). Within the school and college going age groups, 49.4% chewed at least once a week, 31.8% daily and 18.8% within less than a week. Majority (52.9%) of the chewers chewed in the afternoon and in social places with friends. The mean age of first use of *miraa* was 20.8 years (range 7-40 years) while the mean duration for chewing khat was 10.6 years (range 1 -45 years). A slightly higher number of study respondents preferred *miraa* (50.9%) to *muguka* (49.1%). The reasons given by the study population for chewing khat were to reduce sleep, pass time, kill boredom, socialize, reduce stress and to increase energy in order to work for long hours. The mean weekly expenditure on *miraa* was Ksh. 892.04 ± 69.6 . Approximately 22 % of the respondents had ever used money meant to buy food to pay fees or other requirements at home or school to buy *miraa*. Nearly five percent (5.3%) of the respondents reported that children were involved in *miraa* harvesting.

The commonly reported health effects were increased energy and alertness, insomnia, enhanced mood, dehydration and constipation. Among the respondents, 31.7% reported having experienced side effects when they missed to chew khat which included general fatigue, mood swings including anger boredom and restlessness, being sleepy, headaches

and lack of concentration. Only 9.8% of the *miraa* chewers had ever visited a health professional for treatment of effects associated with *miraa* of which 90% disclosed their use of *muguka/miraa*. Lack of success in stopping the *miraa* chewing habit was reported as being addiction, cheap availability and fear of losing friends. More than three quarters (87.2%) of the chewers were aware of the existence of NACADA and its role in campaign against drug abuse. They were also aware of the existence of rehabilitation programmes for drug addicts. About half (50.6%) of the respondents were willing to be enrolled in a rehabilitation programs for drug addicts.

Khat chewing was significantly associated with being of the male gender, being within the age group 26-35 years, having a family member who chewed khat, cigarette smoking and taking alcohol ($p < 0.0001$). Overall 24.7% and 45.6% of the respondents reported that *miraa* and *muguka* respectively was grown in their home area. Of the respondents in Embu County 45% had *miraa* while 95.7% had *muguka* on their farms. Nearly half (43%) of the respondents reported that land segment under *miraa* cultivation was larger than that under other crops. Measures proposed towards mitigating the negative effects of khat consumption were enactment of laws determining the places and time for chewing of *miraa*.

Khat chewing habit is wide spread and affects a fairly large proportion of Embu, Nyeri, Nairobi and Mombasa County residents of which males and individuals within the 26-35 years age group are most affected. The habit of khat chewing reinforces the development of cigarette smoking and alcohol intake. Level of awareness of *miraa* and *muguka* in Embu, Nyeri, Nairobi and Mombasa Counties is high, a large proportion knows that it causes both physical and health problems and a great number consider it a drug. The common health effects perceived to be associated with chewing of *miraa* and/or *muguka* include increased energy and alertness, insomnia, enhanced mood, dehydration and reproductive health effects. Peer and familial khat abuse has a significant impact on adolescent khat chewing behavior.

This study recommends increased health education awareness programs on the potential health hazards of khat chewing, legislation on the use of pesticides in the cultivation of *miraa* and *muguka* in view of their potentially harmful effects on human health. Creation of job opportunities for the jobless and alternative cash crop for those producing *miraa* and *muguka* as a commercial product should also be considered. *Miraa* and *muguka* use control programs need to focus on peers and family members to reduce the prevalence of the habit along with its unfavorable consequences. Further research aimed at elucidating the concentrations of cathinone and cathine in *miraa* and *muguka* grown in different parts of the country. In addition a cost benefit analysis for growing *miraa* should be undertaken.

1.0 INTRODUCTION

1.1 Background Information

Miraa, qat, chat, cat, ghat or khat (*Catha edulis*), is a shrub indigenous to Eastern Africa and Arabic countries. In Kenya, *miraa* production, centred mainly in the Nyambene Hills, is responsible for the economic prosperity of the Igembe and Tigania clans of the Meru. However, growing areas in Kenya are spreading beyond the Nyambene Hills into new areas, such as Embu and Nyeri. Its young buds and tender leaves are chewed to attain a state of euphoria and stimulation (Hussein, 2009). The leaves contain stimulating alkaloids mainly cathinone and cathine which are classified as controlled substances according to the 1971 Convention on Psychotropic Substance (Wedegaertner *et al.*, 2010). However, the *miraa* plant is not regulated by any of the international drug conventions that normally regulate the production of and trade in drugs. The United Nations Office for Drugs and Crime (UNDOC) has left it up to national governments to decide what legal status they wish to ascribe to khat/*miraa*. In East Africa, khat is legal in Ethiopia, Kenya, Djibouti, Madagascar, Congo, South and Central Somalia, Puntland and Somaliland and illegal in Tanzania and Eritrea.

Up until a few decades ago, khat chewing was mainly restricted to older men or members of Muslim communities who used it in lieu of alcohol on religious grounds and, therefore, the habit did not pose serious public health or socio-economic problems. However, in recent years, trends indicate that by and large khat chewing has become a pastime activity resulting in the consumption of large quantities of the stimulant with serious consequences on the health and socio-economic conditions of communities (Aden *et al.*, 2006). *Miraa* use is widespread in Kenya such that a child can access it freely if his or her household plants it (NACADA, 2007).

The *miraa* chewers experience a sense of increased energy levels, increased alertness and ability to concentrate, improvement in self-esteem and suppressed appetite (Numan, 2004). Although *miraa* has been identified as one of the most commonly abused substances in Kenya, restrictions on cultivation, trade and usage have been non-existent (Aden *et al.*, 2006). Much debate in regard to *miraa* production and consumption

revolves around how it should be categorized within the campaign against drugs discourse. This has been mainly due to lack of elaborate data on patterns, social economic and health impacts of *miraa* consumption in the country that could guide in formulating evidence based policy and programs towards production and consumption of *miraa*.

1.2 Statement of the Problem and Justification of the Study

Miraa chewing has similar but less intense effects than the stimulating effects of cocaine. When chewed continually, chronic constipation due to dehydration results. Use of khat by long distance drivers in order to stay awake has been incriminated in causing road accidents with grave outcomes. In addition, long term usage leads to constriction of blood vessels supplying blood to the reproductive tract thereby causing inhibited urine flow, and in men, the inability to attain and sustain an erection. The active chemicals, cathinone and cathine in khat lead to excessive spermatogenesis without arousal with a resultant spermatorrhoea forcing the concerned men to wear nappies or multiple underpants. In women, the dehydrating effects of *miraa* dry the lining of the reproductive tract leading to pain and blistering during sexual intercourse. The micro-injuries can cause reproductive tract infections and increase chances of sexually transmitted diseases.

In addition, chewing *miraa* during pregnancy decreases blood flow to the uterus, disrupting the supply of nutrients from the mother to the foetus. This has been associated with abortion and still births. In Kenya, data on the impact of *miraa* chewing on household micro-economies is lacking. In countries where this has been undertaken, its effects are far reaching. For instance, in Djibouti, khat imports account for about 10% of total imports and hence 10% of total household expenditures. This translates to three times more than the combined household expenditures on health and education. When health effects on the active stratum of the population are considered, the losses are colossal. It is therefore imperative to determine the socioeconomic and health effects associated with *miraa* chewing in Meru and Mbeere regions as well as Eastleigh area in Nairobi County.

1.3 Conceptual Framework

Dependent variables in the proposed study were socioeconomic and health effects. The independent variables associated with target population were; sociodemographic characteristics and awareness, attitudes and practices. The independent variables were conceptualized to have both single and interactive effects on the outcome variables. The strengths of association between the independent and dependent variables were assessed via single-factor analysis and multivariate analysis.

1.4 Research Questions

- i. What is the proportion of persons aged 10-65 years chewing khat in Embu, Nyeri, Mombasa and Nairobi Counties in 2012-2013?
- ii. What are the socio-demographic characteristics of persons aged 10-65 years chewing khat Embu, Nyeri, Mombasa and Nairobi Counties?
- iii. What is the level of knowledge, attitudes and practices of persons aged 10-65 years towards chewing khat in Embu, Nyeri, Mombasa and Nairobi Counties?
- iv. What are the socioeconomic effects of *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties?
- v. What are the perceived health effects of *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties?
- vi. What is the association between the socio-demographic characteristics, socioeconomic and health effects and *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties?

1.5 Overall Objective

To determine the socioeconomic and health effects of *miraa* chewing among persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties, 2012-2013

1.5.1 Specific Objectives

- i. To determine the proportion of persons aged 10-65 years chewing *miraa* in Embu, Nyeri, Mombasa and Nairobi Counties in 2012-2013

- ii. To determine the socio-demographic and socio-economic characteristics of persons aged 10-65 years chewing *miraa* in Embu, Nyeri, Mombasa and Nairobi Counties
- iii. To determine the awareness, attitudes and practices of persons aged 10-65 years towards chewing *miraa* in Embu, Nyeri, Mombasa and Nairobi Counties
- iv. To determine the socioeconomic effects of *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties
- v. To determine the perceived health effects of *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties
- vi. To determine association between the socio-demographic characteristics, socioeconomic and health effects and *miraa* chewing in persons aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi Counties

2.0 MATERIALS AND METHODS

2.1 Study Areas

A cross-sectional survey using in-depth key informant interview, focus group discussion, and structured pre-tested questionnaires was done. Respondents aged 10-65 years in Embu, Nyeri, Mombasa and Nairobi were sampled.

2.2 Sample Size Determination

For each study area, the number of respondents was calculated using the formula $n = Z^2 \frac{pq}{L^2}$ (Martin *et al.*, 1987). Since the prevalence of *miraa* chewing in these areas is not known, p will be estimated to be 50%. As a result ($n = 1.96^2 (0.5) (1-0.5)/0.05^2$), 384 respondents were sampled in each study area.

2.3 Sampling Procedure and Data Collection

Multistage sampling technique was used to select study sites in Embu, Nyeri, Mombasa and Nairobi counties. Simple random sampling was used to choose a location from each of the districts and then at least two sub locations from which households were selected. A starting household was randomly selected and a skip interval calculated based on the population of households within the respective study areas.

The left hand rule was used to identify the next household. In Eastleigh, Nairobi households were selected from the main avenues. All household members aged 10-65 years were eligible. Eligible members were categorized into 10-17 years and 18-65 years. Number of study participants for each category in the study areas were selected using probability proportional to population size at 1:3 ratio (10-17 years: 18-65 years) (KNBS/UNICEF, 2008). In cases where there was more than one member in an age group in the household the respondent was selected by simple random sampling. From each household, two respondents who satisfied the inclusion criteria in each group were selected and questionnaire administered. Information sought includes socio-demographic data, knowledge, attitude and practices, socioeconomic status, information on khat consumption and health effects of khat chewing. Assistants rechecked the data after the interviews to ensure completeness.

2.4 Inclusion and Exclusion Criteria

2.4.1 Inclusion Criteria

The following inclusion criteria were utilized in identifying study participants:

- Respondents must be residents of the selected study areas
- Respondents must be between 10-65 years of age
- For respondents below 18 years of age, consent to participate will be sought from their parents or appointed guardians
- For respondents 18 years and above, informed consent to participate will be sought

2.4.2 Exclusion criteria

The following exclusion criteria were utilized in excluding individuals from participating in the study:

- Respondents residing outside the selected study areas
- Respondents below 10 years and above 65 years of age
- Respondents below 18 years of age whose parents or appointed guardians do not give informed consent to participate
- Respondents 18 years and above who do not give informed consent to participate

2.4.3 Data management and analysis

Data was keyed-in in MS-Access which acted as the database. Data was exported to Statistical Package for Social Sciences (SPSS version 18.0) for analysis. Descriptive statistics were used to describe the parameters of location and dispersion. Frequencies and proportions were determined for categorical variables. Pearson's Chi-square test was used to determine the strength of association between categorical variables. Binary logistic regression analysis was performed on all independent variables previously tested individually and confirmed to relate significantly with the dependent variable(s). Characteristics between *miraa* production zones (Embu) and consumption zone (Nairobi, Nyeri and Mombasa) were compared during data analysis. Results were presented in frequency distribution tables' charts and graphs. Differences between the parameters of estimate were deemed statistically significant at $p < 0.05$.

2.4.4 Ethical considerations

The principles of the Helsinki Declaration were taken into account. Ethical approval was sought from Kenyatta University Ethics Review Committee (KU-ERC). Permission to carry out the study was obtained from the National Council for Science and Technology. Written and oral information were presented to all eligible participants by the researcher and/or research assistants before written informed consent is obtained. Written consent will be obtained from parents/legal guardians of any participants under 18 years of age.

3.0 RESULTS

3.1 Socio-demographic and economic characteristics of study respondents

3.1.1 Distribution of the study respondents by gender, religion and age

A total of 979 respondents consisting of 258 (26.4%) from Embu, 74 (7.6%) from Nyeri, 301 (31.7%) from Mombasa and 337 (34.4%) from Nairobi counties were interviewed. Of these, males constituted 66.3% and females (33.7%). Christians (73.1%) were the majority followed by Muslims (26.5%) and other religious affiliations (0.4%). Majority of the participants in the surveyed counties were within the age group 26-35 years (28.1%) followed by 10-17 years (25.2%), and 18-25 years (19.8%). A similar trend was noted for the counties except for Nyeri County where majority were within the age group 18-25 years (Table 1).

Table 1: Distribution of study participants by county and age

Age in years	Embu		Nyeri		Mombasa		Nairobi		Overall	
	n	%	n	%	n	%	n	%	n	%
10-17	66	25.6	18	24.3	80	25.8	83	24.6	247	25.2
18-25	28	10.9	23	31.1	58	18.7	85	25.2	194	19.8
26-35	59	22.9	12	16.2	98	31.6	106	31.5	275	28.1
36-45	50	19.4	12	16.2	35	11.3	34	10.1	131	13.4
46-55	26	10.1	5	6.8	26	8.4	21	6.2	78	8.0
56-65	29	11.2	4	5.4	13	4.2	8	2.4	54	5.5
Total	258	26.4	74	7.6	310	31.7	337	34.4	979	100

3.1.2 Distribution of the study respondents by highest level of education and marital status

Figure 1 shows the distribution of respondents by their highest level of education. Approximately 97% of the study participants had attained at least primary level of education.

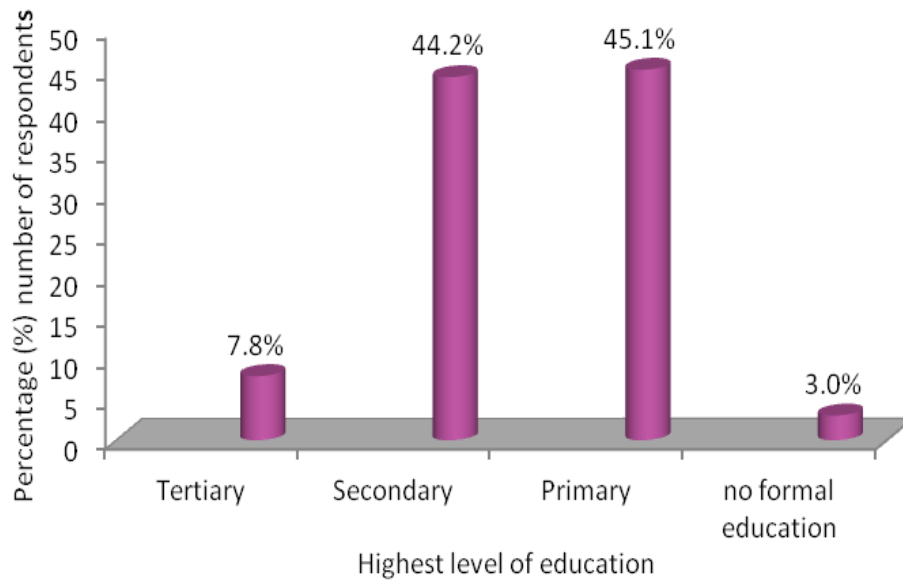


Figure 1: Distribution of study respondents by highest level of education

A large proportion (67.2%) of the respondents in this study were married followed by single (28.7%) and widowed/separated/divorced (4.1%) (Figure 2)

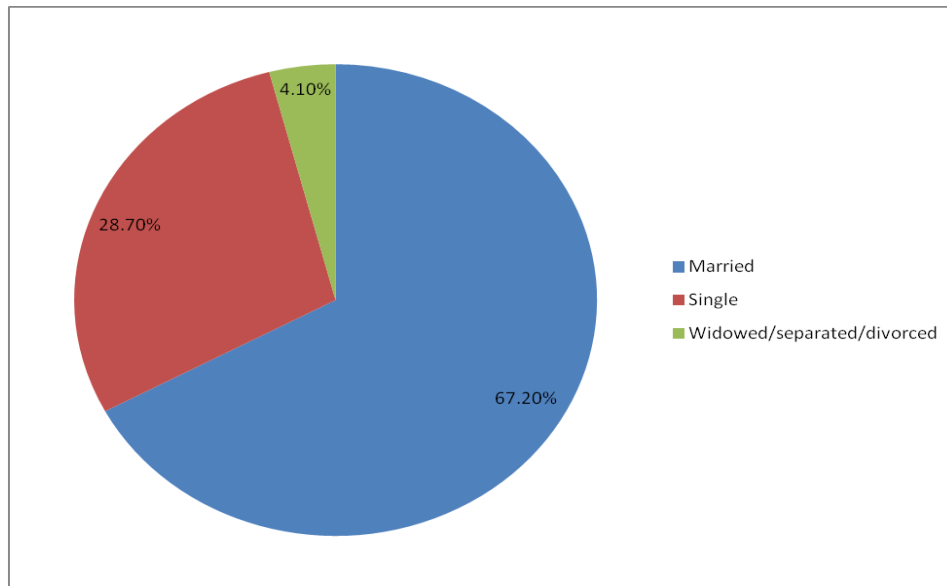


Figure 2: Distribution of respondents by marital status

3.1.3 Distribution of study participants by socio-economic characteristics

Majority of the study participants were engaged in business as their main source of income. Nevertheless majority (76.3%) in Embu County were farmers (Table 2).

Table 2: Distribution of study respondents by source of income

Source of income	Embu		Nyeri		Mombasa		Nairobi		Total	
	n	%	n	%	n	%	n	%	n	%
Salaried job	8	3.1	22	36.7	83	26.9	65	19.4	178	18.5
Casual labor	14	5.4	8	13.3	85	27.5	49	14.6	156	16.2
Business	28	12	23	38.3	123	39.8	188	56.1	365	37.9
Support from parents/relatives	7	2.8	5	8.3	16	5.2	33	9.9	61	6.4
Farming	197	76.3	2	3.3	1	0.3	0	0	200	20.8
Pension	1	0.4	0	0	1	0.3	0	0	2	0.2

Among the khat chewers, the main source of income was business (44.4%) followed by casual labour, salaried job (Figure 3).

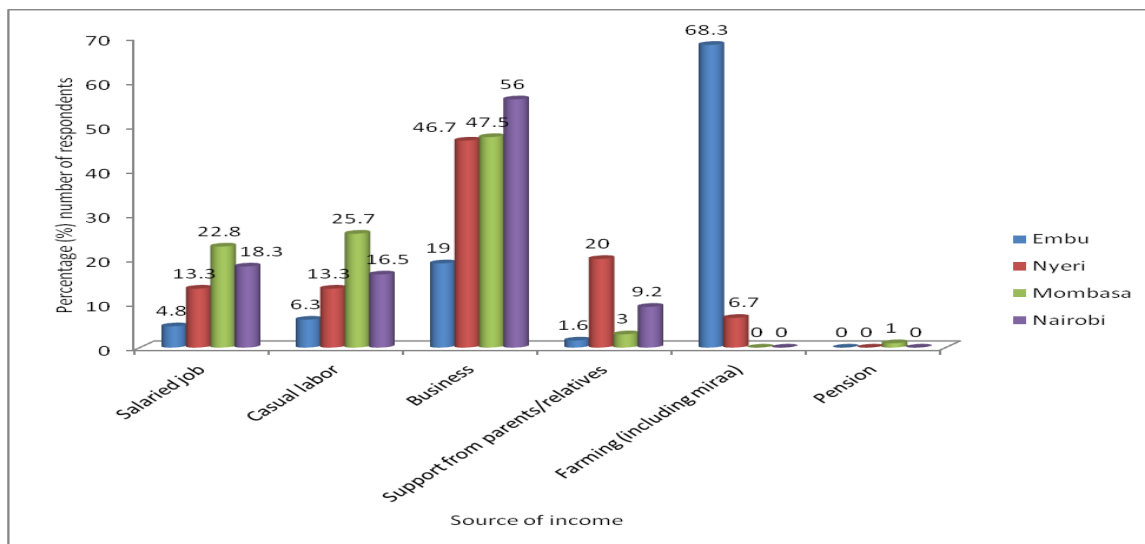


Figure 3: Distribution of khat chewers by source of income

The mean monthly income for the study participants was Ksh 10,687.00. Table 3 shows the distribution of respondents by monthly income and by county. More than three quarters (87.6%) of the respondents earned less than Ksh. 20,000.00. The trend was similar among the *miraa* chewers (Figure 4).

Table 3: Distribution of respondents by monthly income and by county

Monthly income in Ksh x 1000	Embu		Nyeri		Mombasa		Nairobi		Total (%)	
	n	%	n	%	n	%	n	%	n	%
≤20	171	89.5	47	92.2	199	91.7	168	80.4	585	87.6
21-40	15	7.9	2	3.9	15	6.9	31	14.8	63	9.4
41-60	1	0.5	1	2	2	0.9	5	2.4	9	1.3
61-80	2	1	0	0	1	0.5	1	0.5	4	0.6
>80	2	1	1	2	0	0	4	1.9	7	1.0

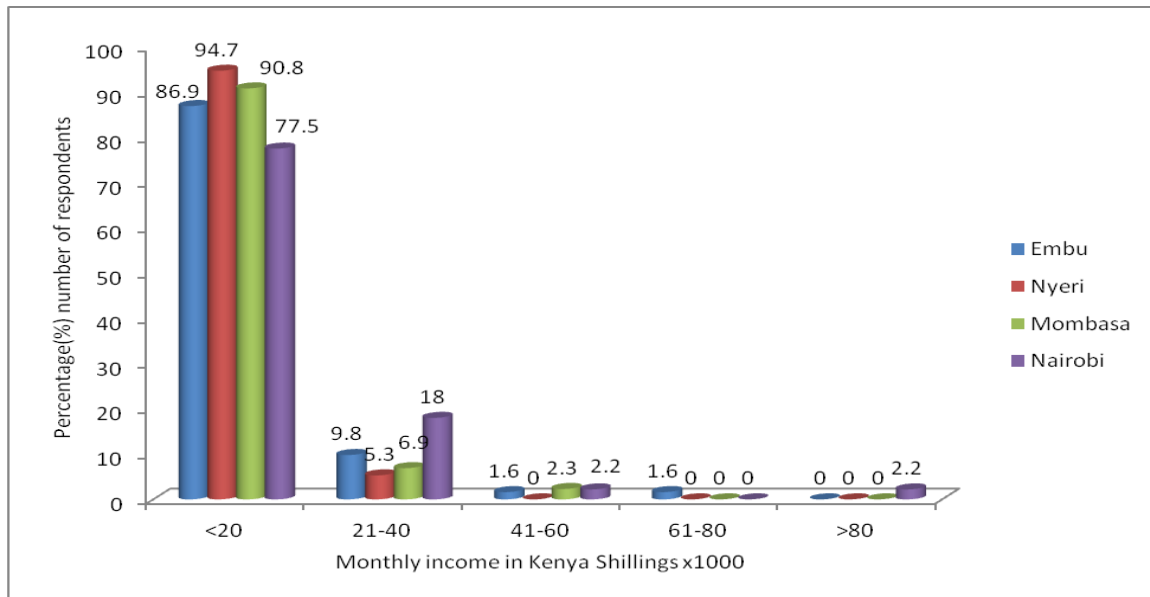


Figure 4: Distribution of monthly income for khat chewers

3.2 Awareness of and attitude towards khat among respondents

Over ninety percent of the respondents were aware of both *muguka* (93.7%) and *miraa* (96.8%). This was supported by the FGD participants in Mbeere, Embu County. “*Biashara ya muguka ndio ile njia muhimu sana ya kujikimu kimaisha hapa Mbeere karibu kila mtu anajua muguka*”. Majority (61.0%) had got the information from friends while others got it from parents 18.5%, relatives 16.5%, media 2.5% and others 1.5%. Two thirds of respondent 67.3% considered chewing of khat a wrong and unfashionable habit while 32.7% thought it was fashionable and a sign of good societal status. The fact that a sizeable number did not consider chewing khat a problem was strengthened by male FGD participants in Mombasa who said “*Mimi ni msalia wa Meru na miraa utumiwa kwa sherehe za utamanduni hata kwa kanisa kwa matoleo ya fungu la kumi*”. More than half (57.3%) of the respondents strongly agreed that khat was addictive, while 48.2% and 48.7% strongly agreed that khat causes both health and physical problems to most people and considered khat as drug respectively (Table 4).

Table 4: Respondents distribution by their attitude towards *miraa* use

Variable	Strongly disagree		Disagree		Agree		Strongly agree	
	n	%	n	%	n	%	n	%
Miraa chewing:								
i) Does not causes problems for most people	359	49.4	158	21.8	122	16.8	87	12.0
ii) Causes both health and physical problems for most people	81	8.4	119	12.3	301	31.1	466	48.2
iii) Is alright for men to chew	356	36.9	226	23.4	273	28.3	110	11.4
iv) Is <i>miraa</i> addictive	24	2.5	61	6.3	327	33.9	554	57.3
v) Is alright for women to chew	668	69.2	182	18.8	91	9.4	25	2.6
v) OK for older people, but not young people	362	37.5	174	18	211	21.8	219	22.7
vi) Is alright if it is done in moderation	199	20.6	194	20.1	351	36.3	222	23
vii) Should be controlled	38	3.9	86	8.9	4.2	42.7	430	44.5
viii) <i>Miraa</i> is a drug	61	6.3	88	9.1	347	35.9	470	48.7
ix) I approve of <i>miraa</i> chewing	381	39.4	258	26.7	237	24.5	90	9.3
x) Men who chew <i>miraa</i> often do not look after their families properly	149	15.4	222	23.0	234	24.2	361	37.4
xi) I would rather my family member chewed <i>miraa</i> / <i>muguka</i> than:								
Drank alcohol	346	35.8	178	18.4	259	26.8	183	18.9
Smoked cigarettes	338	35	171	17.7	271	28.1	186	19.3

3.3 Prevalence of khat chewing among the study respondents

Overall 47.1% of the study respondents reported to have ever chewed *miraa* in their lifetime while the prevalence of current chewing in population studied was 29.9% (293/979). Prevalence was high in Nairobi (32.6%) and Mombasa (37.2%) compared to Embu (21.5%) and (7.0%) Nyeri (Figure 5). Among those in school or college 21.6% and 14.3% had ever chewed *miraa* or *muguka* respectively. Among the chewers the proportion of males (89.1%) was significantly ($X^2 = 14.57$, $p < 0.0001$) higher than

females (10.9%). The key informant interviews identified men as the main chewers of khat. “*The chewing of miraa is a common method of leisure among men in the coast province.*” Among the respondents aged 10-17 years *miraa* chewing was significantly higher among the Nairobi County respondents than in the other areas (Table 6).

Table 5: Prevalence of *miraa* chewing per county and age group

Age (Years)	County								Total (%)	
	Embu		Nyeri		Nairobi		Mombasa		n	%
	n	%	n	%	n	%	n	%		
10-17	2	3.2	0	0	11	10.9	5	4.6	18	6.1
18-25	8	12.7	9	45	18	17.8	32	29.4	67	22.9
26-35	26	41.3	5	25	43	42.6	47	43.1	121	41.3
36-45	17	27.0	4	20	15	14.9	15	13.8	51	17.4
46-55	7	11.1	0	0	11	10.9	6	5.5	24	8.2
56-65	3	4.8	2	10	3	3	4	3.7	12	4.1
Total	63	100	20	100	101	100	109	100	293	100

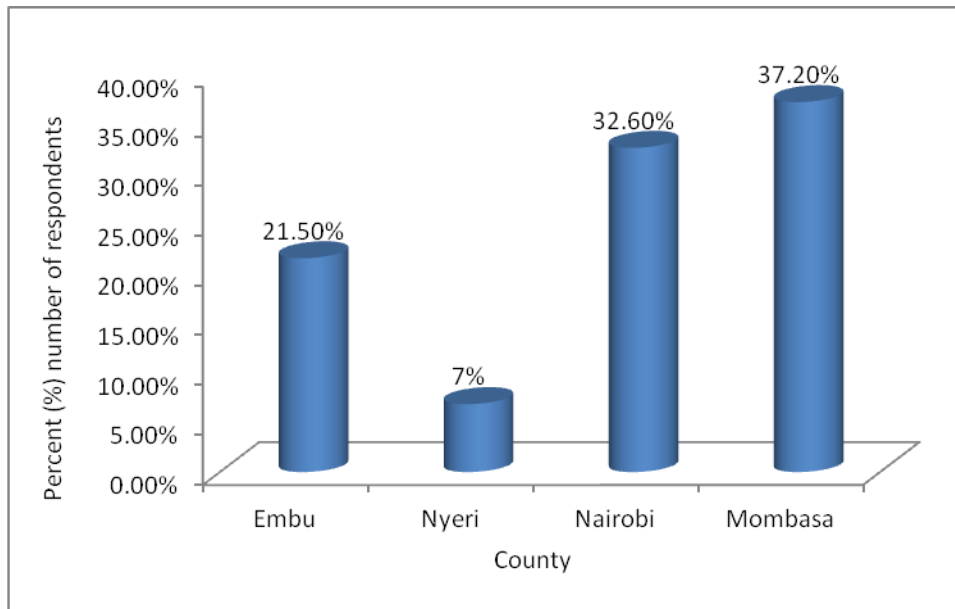


Figure 5: Prevalence of khat chewing among study respondents in various counties

3.4 Patterns of use and practices of khat among respondents

About 46% of the respondents had ever chewed *miraa* while 40.2% had ever chewed *muguka*. Of those who chewed *miraa*, 50.8% had a family member who chews either *miraa* or *muguka*. Among all the respondents in this study, those who introduced chewers to the habit were reported to be parents (13.6%), relatives (14.6%), schoolmates (8.7%) and friends (62.9%). Within the school and college going age groups, 49.4% chewed at least once a week, 31.8% daily and 18.8% in less than a week. Majority (52.9%) chewed in the afternoon, followed by evening (32.9%), morning (5.9%) and late night (8.2%). This observation was in line with statements made during FGD for men in both Embu and Mombasa Counties “*Most men start chewing in the afternoon and may go upto 5.00 am.*” The mean age of first use of khat was 20.8 years (range 7-40 years). The mean duration for chewing khat was 10.6 years. Slightly higher number of respondents prefers *miraa* (50.9%) to *muguka* (49.1%). Most the chewing is done in public social places with friends (47.5%) while others chew at home (27.6%). The practices and patterns of use of khat among the respondents are shown in Table 5.

Table 6: Practices and patterns of use of khat among respondents

Variable	n	%
1. How often you chew		
Daily	91	32.4
At least weekly	156	53.8
Less than once\week	39	13.8
2. Time of day when they start chewing khat		
Morning	32	11.0
Afternoon	167	58.3
Evening	73	25.9
Late Night	14	4.8
3. Where they chew khat		
Home	79	27.2
Friend house	70	25.2
Schools	1	0.3
Social places	136	47.2
4. Who they chew together with		
Relatives	8	28
Friends	209	73.9
Alone	66	23.3
5. Recommend to others to chew khat		
Yes	71	24.8
No	215	75.2
6. Smokes cigarretes		
Yes	141	49.0
No	147	51.0
7. Drinks alcohol		
Yes	125	43.9
No	160	56.1

Majority of the respondents considered themselves as moderate chewers of khat (Figure 6).

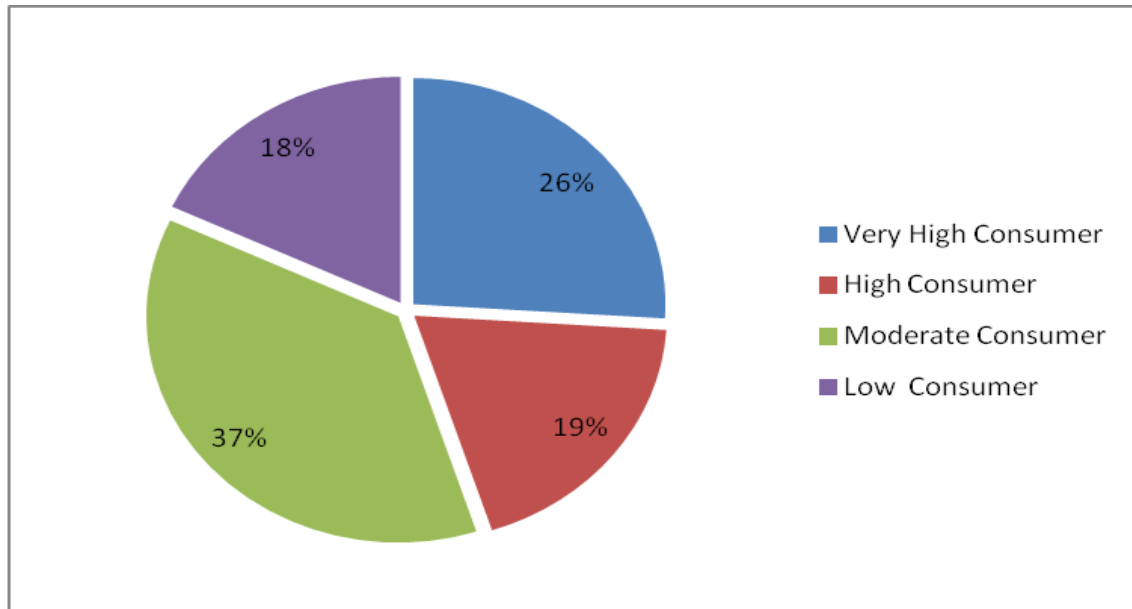


Figure 6: Self ranking of respondents with respect to khat chewing

The reasons given by the study population for chewing khat were to reduce sleep, pass time, kill boredom, socialize, reduce stress and to increase energy to work for long hours. This concurred with FGD participant statements that “*Miraa is taken to stay awake, to increase boldness and to increase energy*”.

3.5 Social and economic effects of khat chewing

The mean weekly expenditure on khat was Ksh. 892.04 ± 69.6. Approximately 22 % of the respondents had ever used money meant to buy food, to pay fees or other requirements at home or school to buy khat. Similar sentiments were expressed by FGD participants in Mombasa “*I know people who have sold items from home to buy miraa. It also leads to borrowing of money to buy miraa or muguka*”. FGD participants in Embu were of different opinion “*The living standard of the people of Mbeere have raised due to the muguka business. More household have permanent house*” About seventeen percent (17.4%) had ever failed to work as result of taking *miraa* (Table 7). Average amount spent on on buying *miraa* per week was Ksh. 892.04. Nearly five percent (5.3%) of the respondents reported that children were involved in *miraa* harvesting. The involvement

of children in harvesting *muguka* was supported by female FGD participants in Mbeere, Embu who said that school children often took part in ‘*Mukei*’. *Mukei* was reported to be the early morning session of *muguka* harvesting. Female FGD participants reported that habitual chewing of khat had resulted in broken families as men chewer spend much of their time chewing than being with their families.

Table 7: Socioeconomic effects of khat chewing

Variable	n	%
Have you ever used money meant to buy food, to pay fees or other requirements at home or school to buy <i>miraa</i>		
Yes	59	21.9
No	211	78.1
Have you ever failed to work as result of taking <i>miraa</i>		
Yes	49	17.4
No	233	94.6
Have you ever been violent towards a family member after chewing <i>miraa</i>		
Yes	5	3.4
No	140	96.6
Has a member of your family who chews <i>miraa</i> been violent towards you or any other member of the family after chewing <i>miraa</i>		
Yes	7	2.6
No	263	97.4

3.6 Perceived health effects of khat-chewing

The reported health effects were increased energy and alertness (88.7%), lack of sleep (insomnia) (80.9%), enhanced mood 90.5%, dehydration 68.6%, constipation 18.7%, lack of sexual arousal 26.9%, urinary incontinence 12.7%, pain during sexual intercourse 6.9%, reduced appetite 72.8%, and spermatorrhoea 13.5%. Among the respondents 31.7% reported that they experience side effects when they have not chewed *miraa*. This

included general fatigue, mood swings including anger, boredom and restlessness, feeling sleepy, headaches and lack of concentration. The majority chewed more khat as a remedy. The FGD participants in Mbeere Embu reported that some of the side effects were due to use of pesticides. According to the participants information on the use of pesticides in *miraa* was not available and many farmers could be selling khat contaminated with the chemicals. Only 9.8% of the khat chewers had ever visited a health professional for treatment of effects associated with *miraa* of which 90% disclosed their use of *muguka/miraa*. About a third (32.8%) expressed their desire to stop chewing but had not succeeded either because they were already addicted, the khat are cheaply and locally available or had fear of losing friends. More than three quarters (87.2%) of the chewers were aware of the existence of NACADA and its campaign against drug abuse and the existence of rehabilitation programmes. About half (50.6%) of the chewers were willing to be enrolled in a rehabilitation program for drug addicts.

3.7 Factors associated with the chewing of khat among respondents

In the current study *miraa* chewing was significantly associated with being of the male gender ($p < 0.0001$). Chewing of khat was significantly associated with individuals within the age group 26-35 years ($X^2 = 26.73$, $p < 0.0001$). The respondents within this age group were 2.2 times (CI 1.473-3.441) more likely to chew khat as compared with other age groups. This study found a significant association between having a family member who chewed khat and chewing khat. There was also a statistically significant association between khat chewing and cigarette smoking as well as taking alcohol ($p < 0.0001$).

3.8 Production of khat

Overall 24.7% and 45.6% of the respondents reported that *miraa* and *muguka* respectively was grown in their home area. Of the respondents in Embu County 45% had *miraa* while 95.7% had *muguka* on their farms. Nearly half (43%) of the respondents reported that land under *miraa* cultivation was larger than that under other crops. *Miraa* and *muguka* were reported to bring more money than other crops by over 90 % of the respondents (92.8%)

3.9 Possible intervention measures for mitigating the negative effects of khat chewing

Seventy eight percent of respondents reported a need to have legislation to control use of *miraa* and *muguka*. Measures proposed to address the negative effects of *miraa* or *muguka* consumption included enactment of laws and regulations determining the places and time when *miraa* should be chewed, introduction of peer counseling/ education on drug and substance abuse, children to be discouraged from being involved in harvesting of *miraa* and legislation to control use of khat.

4. DISCUSSION

About two thirds (66.3%) of the respondents in this study were males with females comprising (33.7%). This concurs with reports by NACADA, (NACADA, 2012) which reported males to constitute more than half of the surveyed population (54.4% among 10-14 years and 51.3% among the 15-65 years). Majority (28.1%) of the survey participants were within the age group 26-35 years. Similar findings have been reported in a study done in Ethiopia on khat chewing and its socio-demographic correlates where majority of participants were within age group 25-34 years (Gelaw and Amlak, 2004). However it differs from what was reported in a previous study in Kenya where majority of the participants were within the age group 36+ years (NACADA, 2012). This could be due to the fact that the present study dealt with population within production and consumption areas. The findings that Christians were the majority among the respondents surveyed followed by Muslims and others religious affiliations and approximately 98% of study participants had attained at least primary level of education. These study findings agree with observations of a previous study in Kenya (NACADA, 2012). In line with previous studies (NACADA, 2012) most (62.0%) of the respondents in the current study were married.

Most (38%) of the respondents across the counties surveyed engaged in business as their main source of income and this is consistent with other reports (NACADA, 2012). Nevertheless majority (76.3%) of those surveyed in Embu County were farmers. This was due to the fact that the survey for Embu, a production area, was done in a rural setting. Among *miraa* chewers, the main source of income was business (44.4%) followed by casual labour, salaried job.

The level of awareness was very high for both *muguka* (93.7%) and *miraa* (96.8%). This finding concurs with a survey done in Kenya, (NACADA, 2012). In Kenya, *miraa* is commonly used for social recreation. Occupational groups such as motor vehicle drivers, truck drivers, who chew khat during long distance driving, to keep awake, also use it

under a variety of other conditions. Source of information included friends (61.0%), parents (18.5%), relatives 16.5%, media 2.5% and others 1.5%.

The overall prevalence of current chewing of *miraa* reported in this study (29.9%) was higher than 9.4% national prevalence of khat chewing recently reported by NACADA (NACADA, 2012). The difference may be because of the fact that the current study included *miraa* growing area where residents directly depended on *muguka* or *miraa* economically through cultivation and marketing, and respondents from this area are thus likely to develop habit of consuming *miraa*. Few reports could be found in the literature on the prevalence of khat in the general population. However, studies dealing with specific population segments have been documented. A survey carried out in a rural Ethiopian community (Alem *et al.*, 1999) found that the prevalence of current khat use was 50%. A study done in three towns in south-western Uganda (Ihunwo *et al.*, 2004) showed that the use of khat was highest among law enforcement officials (97.1%), followed by transporters (68.8%) and students (9.2%). Slightly higher number of respondents reported to prefer *miraa* (50.9%) to *muguka* (49.1%). Prevalence of chewing *miraa* was high among respondents in Nairobi and Mombasa compared to Embu and Nyeri counties which are clusters of consumption and production areas respectively. This finding concurs with data from a national survey done recently in Kenya that showed that consumption of khat is relatively high in Coast and Nairobi provinces (NACADA, 2012).

In the current study *miraa* chewing was significantly associated with being of the male gender ($p < 0.0001$) and this is consistent with other reports (Aden *et al.*, 2006; Mossie, 2002). This may be because females are more culturally restricted from exposure to khat chewing than males (Gelaw and Amlak, 2004) and economic dependency among the women in most parts of Kenya (Aden *et al.*, 2006). Chewing of *miraa* was significantly associated with individuals within the 26-35 years age group. This finding concurs with previous studies in Kenya (Aden *et al.*, 2006; NACADA, 2012) but differs from reports from studies in Saudi Arabia where the majority of khat chewers were in the age range of 16–25 years (Hussein, 2009). This finding is closer to the results of similar studies done

in Ethiopia which reported that the peak age of khat chewing was 21- 44 years (Alem *et al.*, 1999) and 18-44 years (Gelaw and Amlak, 2004). Among the respondents aged 10-17 years use was high in Nairobi than in the other areas. About 46% of the respondents had ever chewed *miraa* while 40.2% had ever chewed *muguka*. Of those who chewed *miraa*, 50.8% had a family member who chews either *miraa* or *muguka*. This study found a significant association between having a family member who chewed *miraa* and chewing *miraa*. Family members' khat chewing status, having close friends who chew khat or smoke, and student smoking status were highly associated with a significant risk of khat chewing (Mahfouz *et al.*, 2013).

The statistically significant association ($p < 0.0001$) between khat chewing and cigarette smoking and taking alcohol in this study is in line with findings from other studies done in Ethiopia, and Somali (Alem *et al.*, 1999, Gelaw and Haile-Amlak, 2004). In most cases smoking of cigarette while chewing khat increases the excitation that one gets from khat chewing alone; both are known to stimulate the central nervous system. Khat chewers are believed to take alcohol to break the stimulating effect of khat after long hours of stimulation by the central inhibitory effect of alcohol (Gelaw and Haile-Amlak, 2004). According to Dhaifalah and Santavy (2004) smoking tobacco and cigarettes and drinking cola, weak black tea or just cold water greatly enhance the pleasure of chewing and some khat chewers have the habit of using sugared menthol or pieces of sugar or even cardamon to improve the bitter taste of khat. Khat increases the desire for active tobacco smoking and is associated with passive smoking (Al-motreb *et al.*, 2002).

According to data from the current study most of the chewers were introduced to the habit by their friends (62.9%), relatives (14.6%), parents (13.6%) and (8.5%) schoolmates. This finding is in line with a recent study among adolescents in Saudi Arabia where about half of the female students and a third of the male students chewed khat for the first time with family members and relatives (Mahfouz *et al.*, 2013). The mean age of 20.8 years onset of use of *miraa* reported in this survey was higher than 16.4 years reported by Mossie (2002). This indicates that the khat chewing habit affects the most productive sections of the society.

The mean life time duration (10.6 years) for chewing *miraa* observed in the current study differs from 4 years reported by Gelaw and Haile-Amlak, (2004). The difference may be explained by the fact that the current study was done in a *miraa* production zone and known consumption zones. More than half (58.3%) of the chewers in this study start chewing *miraa* in the afternoon, with a quarter (25.5%) starting later in the evening. The finding concurs with reports by Aden *et al.*, (2006) that social gatherings for purposes of khat chewing typically start in the afternoons. In line with a recent study (Mahfouz *et al.*, 2013) most the chewing is done in public social places with friends (72.4%) while others chew at home (27.2%). The finding that those who chewed *miraa* at least weekly constituted 87% of the respondents is inline with previous studies (Gelaw and Haile-Amlak, 2004).

According to this study mean weekly expenditure on *miraa* was Ksh. 892.04 ± 69.6. Approximately 22 % of the respondents had ever used money meant to buy food, pay fees or other requirements at home or school to buy *miraa*. This is in agreement with reports by Dhaifalah and Santavy (2004) that from the economical point of view khat diverts household income that could have been wisely used for nutritious food, home improvements, education or other family needs that people are in dire need of. About seventeen percent (17.4%) had ever failed to work as result of chewing *miraa*. Similar studies have reported higher proportions for example nearly half (50.4%) of the chewers reported that they had missed their regular work at Jimma University in Ethiopia (Gelaw and Haile-Amlak, 2004). This might, in one way or another, have a negative effect on service delivery and finally affect the development of the country since productivity is reduced in quantity and quality as the result of absenteeism and the after-effect of the drug. About five percent (5.3%) of the respondents reported that children were involved in *miraa* harvesting. School going children are involved in picking, selling, planting, weeding and transporting *miraa* to markets while others chew the drug.

The reasons given by the study population for chewing khat were to reduce sleep, pass time, kill boredom, socialize, reduce stress and to increase energy to work for long hours. This finding is similar to previous reports and it indicates that khat has similar effect on

users as that of amphetamine and other psychostimulants (Kalix, 1987; Kebede, 2002; Gelaw and Haile-Amlak, 2004). Moreover modern users report that chewing khat results in increased energy levels, alertness and confidence, a sense of happiness, better thinking capacity and creativity, facilitation of communication ability, enhanced imaginative ability and the capacity to associate ideas (Kalix, 1987; Al-motrreb *et al.*, 2002).

Consistent with previous studies (Al-motrreb *et al.*, 2002) a large proportion of khat users in the current study reported increased levels of energy and enhanced mood. More than eighty percent (80.9%) of the khat users in the current study reported having experienced insomnia. Insomnia is a common effect of khat use that the users sometimes try to overcome with sedatives or alcohol. Constipation 18.7%, Constipation is the most common medical complaint of the khat users and it is attributed to both tannins and norpseudoephedrine (Al-motarreb *et al.*, 2002). Over seventy percent of the khat chewer reported having experienced reduced appetite. Anorexia frequently follows a khat session and chewers seldom eat a significant meal on the same day (Hassan *et al.*, 2007). An important consideration is that, khat use may endanger health in that the resulting anorexia leads to malnutrition and thereby to increased susceptibility to infectious diseases (Dhaifalah and Santavy, 2004). Spermatorrhoea which is known to usually occur at the first micturation after the session ends was reported by 13.5% of *miraa* users (Dhaifalah and Santavy, 2004). The active chemicals, cathinone and cathine in khat lead to excessive spermatogenesis without arousal with a resultant spermatorrhoea.

Dehydration, lack of sexual arousal, urinary incontinence and pain during sexual intercourse were also reported. Long term usage of khat leads to constriction of blood vessels supplying blood to the reproductive tract thereby causing inhibited urine flow, and in men, the inability to attain and sustain an erection. In women, the dehydrating effects of *miraa* dry the lining of the reproductive tract leading to pain and blistering during sexual intercourse. The micro-injuries can cause reproductive tract infections and exposure to sexually transmitted diseases (Getahun *et al.*, 2010). Thirty two percent of the current *miraa* chewers reported withdrawal effects which included tiredness, mood swings, feeling sleepy, headaches and lack of concentration. This finding is in agreement with

other studies which have report withdrawal symptoms after prolonged khat use to include lethargy, mild depression, slight trembling and recurrent bad dreams (Gelaw and Haile-Amlak, 2004). The fact that those who had withdrawal symptoms chewed *miraa* as a cure poses a great challenge in curbing health effects caused by the habit. However on a positive note about half (50.6%) of the respondents reported their willingness to be enrolled in rehabilitation programs.

Although close to a third (32.8%) of the khat chewers reported having had a desire to stop chewing only 9.8% of them had ever visited a health professional for treatment of effects associated with *miraa*. Lack of success in stopping the *miraa* chewing habit was reported as being addiction, cheap availability and fear of losing friends. Approximately two thirds (67.3%) of the respondents in the current study considered chewing a bad and unfashionable habit while the remaining one third (32.7%) thought it was good and fashionable habit and a sign of good societal status. More than half (57.3%) of the respondents strongly agreed that chewing of *miraa* was addictive while (48.2%) strongly agreed that it causes both health and physical problems to most people. Very close to half (48.7%) strongly agreed that *miraa* as drug. These observations differ from what was reported in a study done in Ethiopia (Baynesagne *et al.*, 2009). The disparity may be accounted for by the differences in study populations. There was strong expression for the need to set up a regulation on the use of khat as 44.5% of the respondents strongly agreed that chewing of *miraa* should be controlled. Moreover seventy eight percent of the respondents reported that there was need for a legislation to control use of *miraa* and *muguka* and for introduction of peer counseling on drug and substance use and abuse. Forty three percent of the respondents reported that land under *muguka* cultivation was larger than that used for other crops. Over ninety (92.8%) of the respondents reported that *miraa* and *muguka* fetched more money than other crops.

5. CONCLUSIONS

1. Khat chewing habit affects a fairly large (47.1%) proportion of population in Embu, Nyeri, Nairobi and Mombasa counties of which males and individuals within the 26-35 years age group are most affected.

2. The habit of khat chewing reinforces the development of cigarette smoking and alcohol intake.
3. Level of awareness of *miraa* and *muguka* in Embu, Nyeri, Nairobi and Mombasa Counties is high, a large proportion knows that it causes both physical and health problems and a great number consider it as a drug.
4. The common health effects perceived to be associated with chewing of *miraa* and/or *muguka* include increased energy and alertness, insomnia, enhanced mood, dehydration and reproductive health effects.
5. Peer and familial khat abuse has a significant impact on adolescent khat chewing behavior.

6. RECOMMENDATIONS

1. NACADA in collaboration with The Ministry of Health should carryout education campaigns on the potential social, economic and health hazards of khat chewing.
2. The Ministry of Agriculture, Livestock and Fisheries should provide of guidelines on the use of pesticides in the cultivation of *miraa* and *muguka* in view of their potentially harmful effects on human health.
3. NACADA should initiate *miraa* and *muguka* abuse control programs among the adolescent focusing on the role played by peers and family members who chew khat to reduce the prevalence of the habit along with its unfavorable consequences.
4. The National Commission for Science, Technology and Innovation (NACOSTI) in collaboration with other research funding agencies to consider funding research aimed at elucidating the concentrations of cathinone and cathine in *miraa* and *muguka* grown in different parts of Kenya.
5. The Ministry of Agriculture, Livestock and Fisheries in collaboration with stakeholders should undertake a cost benefit analysis of growing *miraa*

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8. APPENDIX 1: STUDY LIMITATIONS

The survey had initially proposed cover five regions of the country, namely, Nairobi, Embu, Nyeri, Mombasa and Garissa Counties. However data was collected from four of the five regions. We were not able to collect data from Garissa due to security concerns. This was occasioned by the fact that during the period of the survey Garissa was experiencing rampant grenade attacks. Although it may have been important to have data from Garissa we are of the opinion data from other khat consumption zones like Nairobi and Mombasa would give a reflection of the situation in Garissa which is also a khat consumption zone.