

# Prevalence of Cigarette Smoking and Associated Factors Among Adolescents in Eastern Ethiopia, 2020

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**Background:** Cigarette smoking is one of the leading causes of preventable morbidity and mortality globally, and it is accountable for many causes of premature deaths. Despite the negative consequences of cigarette smoking, studies to identify factors associated with cigarette smoking are scanty and little is known about this practice in the Somali region so far, so this study aimed to assess the prevalence of cigarette smoking and associated factors among adolescents in the Gode, eastern Ethiopia 2020.

**Methods:** A community-based cross-sectional study design was employed among 341 adolescents in the Godey administration of the Somali Region, Eastern Ethiopia from July to August 2020. A systematic sampling technique was used to select study participants. Data were collected using a pretested interviewer administered questionnaire. The collected data were entered with Epi-Data version 3.1 and exported to SPSS version 22 software for statistical analysis. Multivariable logistic regression analyses were done to identify the true effect of predictor variables on the outcome variable after controlling for possible confounders. Statistical significance was declared at a p-value < 0.05.

**Results:** Over all, the prevalence of current cigarette smoking among adolescents was found to be 21.1% (95% CI: (16.7–25.5). Having smoker parents [AOR = 2.57, 95% CI: (1.32–5.02)], whose friends smoke cigarette [AOR = 4.78, 95% CI: (2.12–10.76)], and currently chewing *khat* [AOR = 6.01, 95% CI: (2.96–12.23)] were significantly associated predictors of current cigarette smoking in the final model of multivariable analysis.

**Conclusion:** The prevalence of cigarette smoking was relatively high in this study area. This study reported having smokers' parents, having smokers' friends and chewing *khat* were found to be independent predictors for cigarette smoking. Therefore, effective smoking prevention and intervention programs are required in this area.

**Keywords:** adolescent, tobacco, cigarettes, *khat*, smoking, substances

## Introduction

Smoking is one of the leading causes of preventable morbidity and mortality worldwide and is responsible for millions of premature deaths. Tobacco smoke is a risk factor for cardiovascular disease, asthma, pneumonia, lung cancer, and other cancers.<sup>1–3</sup> The World Health Assembly urges governments to reduce cigarette consumption by 30% between 2013 and 2025 and prevent 200 million deaths from smoking, but data show that one person dies from smoking every 6 seconds. According to WHO data, tobacco currently kills up to 50% of those who use it. It also reported that, an estimated 1.3 billion smokers live in low- and middle-income countries.<sup>4,5</sup>

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According to the latest data, it is estimated that 50% of young men and 10% of young women will become smokers, and the number of deaths due to tobacco use each year will gradually increase, reaching about 10 million within the next few decades.<sup>6–9</sup> Cigarettes are the biggest threat in Africa. In Africa, tobacco smoke is predicted to be present in 3.46% to 36.6% of adolescents, with 7.8% to 35.5% in adolescent boys.<sup>7</sup>

In sub-Saharan Africa, there are about 84 million smokers, and more than 331 million adolescents actually live there. If no action is taken, the number of smokers in sub-Saharan Africa is expected to increase by 148% by the end of 2030.<sup>8</sup>

Adolescence is a period of self-reflection of new roles and experimenting with new experiences, so many young people are forced to smoke or take drugs as attempts that are ultimately difficult to overcome and lead to premature death. A previous study reported factors associated with cigarette smoking in adolescents include residences, parental smoking, *khat* chewing, peer effects, and lack of knowledge regarding the deleterious effects of smoking.<sup>10–13</sup>

The use of tobacco smoke is one of the Ethiopia's major health and socio-economic problems, especially in groups of adolescents. As reported in the 2016 Ethiopian Demographic Health Survey (EDHS), regional differences in smoking ranged from 1% in Amhara to 13% in Dire Dawa, with the highest smoking rate reported in the Somali region, which was at 18%.<sup>14</sup> There are few studies in Ethiopia on adolescents smoking, but there are study limitations in eastern Ethiopia, especially in the Somali region. Moreover, the previous few studies conducted in Ethiopia focused on institutions such as universities and college students.

The Somali region state of eastern Ethiopia shares cultural, ethnic, and religious ties with Eastern African nations like Somalia. Thus, this research will be input for regional governments to develop tobacco prevention strategies that are culturally, ethnically, and religiously compatible.

Therefore, this community-based study aims to identify the prevalence and determinants of smoking among adolescents residing in Gode, eastern Ethiopia.

## Methods and Materials

### Study Area and Period

The study was conducted in the Gode City Administration of Eastern Ethiopia from July to August 2020. Gode City Administration is found in eastern Ethiopia, located

1295 km east of Addis Ababa. The city has 15 urban administrative kebeles and the majority of the people living in this area are Somali in ethnicity (97%) and Muslim in religion (99%).

### Study Design

A community-based cross-sectional study design was employed.

### Study Population

All randomly selected adolescents aged 10–19 years, who had been living in Gode for at least 6 months, were considered as the study population. Those adolescents who were seriously ill during the data collection period were excluded from the study.

### Sample Size Determination

The minimum required sample size for this study was determined using a single population proportion formula. The proportion of adolescent cigarette smoke was taken from a study done in Makele, Ethiopia, which was 29.5%,<sup>15</sup> with an assumption of margin error of 5%, a confidence interval of 95%, and a non-response rate assumed to be 10%.

$$n = \frac{(Z\alpha/2)^2 p (1 - p)}{(d)^2}$$

where n = Sample size, Z = value corresponding to a 95% level of significance = 1.96

P = proportion cigarette smoking among Mekele 29.5%

d = marginal error assumed to be 5%.

$$n = \frac{(1.96)^2 (0.295 \times 0.705)}{(0.05)^2} = 320$$

Including 10% (Non respondents) = the final sample size for this study was 352 adolescents.

### Sampling Technique and Procedure

Since all kebel in Gode city administration are homogeneous, five city kebel were randomly selected from 15 kebel in Gode city administration. Hence, a preliminary assessment was conducted in each selected kebele to identify households with adolescents aged 10–19 years along with their corresponding household identification numbers. Using respective household identification numbers, frames of households containing study participants were prepared. The sample size was then distributed proportionally for

each selected kebele based on the number of adolescents identified during the preliminary study. Lastly, adolescents were carefully chosen using systematic random sampling techniques from a frame containing a respective source of the population. A K-interval calculated from the list was 13,105 (K interval  $13,105/342=38$ ). As a result, approximately every 38th household with adolescents was visited. Whenever more than one eligible respondent was found in the same household, only one respondent was included in the study by a lottery method.

## Data Collection Methods and Materials

Face-to-face interviews were conducted using a structured and pretested questionnaire adapted and modified from Global Youth Tobacco and other relevant literature. The questionnaires were translated into the local language and it cover socio-demographic, personal, social, and family factors. The data were collected by five BSc nurses and two supervisors who were trained for two days. The data collectors interviewed the adolescents after they decided to participate in the study. The two supervisors closely supervised the quality of the data.

## Variables and Measurements

In this study, the outcome of interest was current cigarettes smoking status. The current smoking status of the adolescents was measured by asking respondents “have you smoked cigarette within the last 30 days preceding the study”? Those adolescents answering “Yes” to the question are classified as current smokers, and those answering “No” are categorized as current non-smokers.<sup>16</sup> The explanatory variable was socio-demographic factors such as: age, sex, education, occupation, and marital status. Personal and social factors like: peer influences, having friends who smoke, social media, *khat* chewing, alcohol drinking, any other substances used, advertisements, believe the harmfulness of tobacco. Family factors include: smokers’ parents, educational level of parents, marital status of the parents, occupation of the parents, and family supervision. Believe the harmfulness of tobacco is measured using the item “Is tobacco smoking harmful to your health? 1. Definitely not. 2. Probably not. 3. Probably yes, 4. Definitely yes”. Knowing the harmfulness of tobacco. It was divided into two parts. Definitely not, and probably not coded as 2, which means it will not hurt. Probably yes, and definitely yes, in category 1, meaning yes, tobacco is harmful to your health.

Having friends who smoke was assessed using the item “Do any of your closest friends’ smoke tobacco?” 1. none of them, 2. some of them, 3. most of them, 4. all of them.

The variable was recorded as “2” = “none of them smoke” and the rest as “1” = “friends smoke cigarettes”.

“Alcohol use was evaluated with the question, “Did you ever drink alcohol?” “Never,” “one or two days in the past year,” “once a month or less,” “2 or 3 days a month,” “1 or 2 days a week,” “3 to 5 days a week,” and “every day or almost every day” were the original response options. Then, it was grouped into two: 1 for ever drinking alcohol and “2” for never drinking alcohol.

Parental smoking is determined by the response to the question “Do your parents smoke? Respondents were given the following option: 1 = none, 2= Both 3 = father only, 4 = mother only. It was further grouped into 1 = parent smoking, 2 = parent not smoking.

“Khat chewing” was also evaluated using the item “In the last 30 days, how often did you chew Khat?”. Respondents who answered “every day”, “almost every day”, “2–3 times a week”, “once a week” and “once a month” were classified as “current Khat Chewers”, whilst those who answered “I did not chew Khat” during the last 30 days were categorized as “non-chewers.

## Operational Definition

**Current cigarette smokers:** An adolescent who smoke cigarette at least once in the last 30 days prior to data collection time.<sup>17</sup>

**Adolescence:** is a developmental stage of 10 to 19 years where rapid development occurs, and it is a time when young people rapidly change physically and mentally, acquire new capacities, and are faced with many new situations.<sup>18</sup>

*Khat* is a plant with fresh leaves and soft twigs with amphetamine like characteristics, with effects including insomnia, euphoria, decreased fatigue, and suppressed appetite when chewed. It is a perennial shrub whose leaves are chewed for its stimulant effect.

## Data Quality Control

The English version’s structured questionnaires were translated into Somali and then re-translated back into the English version to ensure its consistency. Then, 5% of the questionnaires were pre-tested before conducting actual data collection in Kebele, which was not included in the study, and possible modifications were made. Data collectors, along with the supervisors, were trained for two days regarding the purpose of the study, and data

collection procedures. Close supervision of data collectors was done on a daily basis.

## Data Processing and Analysis

The data were entered into Epi-Data version 3.1 and analyzed with SPSS version 22 software. The descriptive statistics were carried out. A bivariable analysis was done to select candidates' variables for multivariable analysis, and all variables having a p-value less than 0.25 were included in the multivariable logistic regression model. The model adequacy has been checked using Hosmer and Lemeshow goodness of fit tests. Moreover, multicollinearity was checked using the variance inflation factor (VIF) and tolerance. Finally, the strength of the associations between the outcome and independent variables was assessed using an adjusted odd ratio (AOR) with a 95% confidence interval. A p-value < 0.05 was used to determine the statistical association in the multivariable analysis.

## Ethical Consideration

The Institutional Review Board (IRB) of Jigjiga University granted ethical approval in accordance with the Declaration of Helsinki. The Gode town administration office has authorized the study in writing. Participants were informed that participation in the study was entirely voluntary. Each participant signed an informed consent form. For participants under the age of 18, written consent from their parents or guardians was obtained. All data were anonymized during the data collection process.

## Results

### Socio-Demographic Characteristics

A total of 341 participants were included in the study, with the response rate of 96.9%. The mean age of participants was 16.5 SD  $\pm$  1.926. More than half of the study participants, 171 (50.1%), were in the age range of 17–19 years. The majority of the participants, 302 (88.6%) and 303 (88.9%), were Somali and Muslim, respectively. In regard to the sex of the adolescents, more than two-thirds (70.3%) of the study participants were male. Nearly half of participants, 164 (48.1%), attended secondary school and 63 (18.5%). Only 46 (13.5%) fathers and 18 (5.3%) mothers of respondents had attended college and university (Table 1).

**Table 1** Socio Demographic Characteristic of Study Participants in Gode, Eastern Ethiopia, 2020 (N = 341)

Variables	Categories	Frequency (N)	Percentage (%)
Age in year	10–13	54	15.8
	13–16	116	34.0
	17–19	171	50.1
Sex	Male	243	71.3
	Female	98	28.7
Marital status	Currently married	43	12.6
	Not married	298	87.4
Ethnicity	Somali	302	88.6
	Other	39	11.4
Religion	Muslim	303	88.9
	Other	38	11.1
Occupation	Students	232	68.0
	No occupation	36	10.6
	Daily laborer	73	21.4
Education level of participants	Not attended formal education	63	18.5
	Primary	84	24.6
	Secondary	164	48.1
	College and University	30	8.8
With whom you live	Family	200	58.7
	Alone	95	27.9
	Relatives	46	13.5
Educational level of the father	Not attended formal education	122	35.8
	Primary	152	44.6
	Secondary	21	6.2
	College and University	46	13.5
Educational level of mother	Not attended formal education	187	54.8
	Primary	112	32.8
	Secondary	24	7.0
	College and University	18	5.3

### Prevalence of Cigarette Smoking and Smoking Characteristics of the Participants

Of 341 adolescents, 72 of them were currently smoking a cigarette, thus the prevalence of current smoking was 21.1% (95% CI: (16.7 25.5)). In this study, the prevalence of cigarette smokers was 28.0% and 4.1% among males and females, respectively. Among nonsmokers, 28 (10.4%) of them had previously smoked cigarettes.

The majority, 39 (54.2%) of adolescents who smoke began smoking between the ages of 13–16, and the mean age of starting smoking was 15.75 years. The mean number of cigarettes smoked each day was 10.486 with SD



+4.49, and roughly 45.8% of smokers smoked in excess of 10 pieces of cigarettes daily (Table 2).

This study also found that nearly half (47.2%) of current smokers began smoking as a result of peer pressure, whereas 22.2%, 18.1%, and 12.5% of current cigarette smokers initiated cigarettes due to entertainment, stress relief, and experiments, respectively.

## Factors Associated with Cigarette Smoking (Multi-Variable Analysis)

In this study, having a cigarette-smoking parent, an adolescent whose friend smokes cigarettes, and an adolescent who chews khat were significantly associated with current cigarette smoking.

The odds of cigarette smoking were 2.57 folds [AOR=2.57, 95% CI: (1.32–5.02)] higher among adolescent whose parents smoked than their counterparts. It also found that khat chewing strongly associated predictor of current cigarette smoking. Adolescents who currently chew khat were 6.1 times more likely to smoke cigarettes than non-khat chewers [AOR = 6.01, 95% CI: (2.96–12.23)].

Furthermore, this study found that having a smoker friend increases the risk of cigarette smoking. Adolescents who had smoker friends were 4.78 times more likely to smoke cigarettes [AOR = 4.78, 95% CI: (2.12–10.76)] than adolescents who had nonsmoking friends (Table 3).

## Discussion

In this study, the overall prevalence of current cigarette smoking among adolescents in the Gode administration of Eastern Ethiopia was found to be 21.1% [95% CI: (16.7–25.5)]. This study is nearly similar to a previous study that reported 17.2%

of Ethiopian adolescents smoke cigarettes.<sup>19</sup> In contrast to the previous study, this study's findings were lower than those reported from Mekele (29.5%), Jimma (42.8%), and Eldoret (43.8%) of western Kenya.<sup>15,20,21</sup> The study setting and residency could be the explanation of the disparities in prevalence. In our study, we only looked at adolescents from urban areas. This study was also found to be high when compared to previous studies done in Ethiopia's urban and rural areas (3%), Bale (4.6%), Shewa (4.5%), Northwest Ethiopia (6.8%), and Eastern Africa (9.02%).<sup>22–26</sup> Previous studies were conducted in academic institutions such as high schools, colleges, and universities. In addition, this study was conducted in eastern Ethiopia, where khat chewing and tobacco use are common, and our study was a population-based study that only included adolescents from the urban. This study noted that the majority of current smokers (54.2%) began smoking between the ages of thirteen and sixteen.

In the current study, respondents whose parents smoked cigarette had higher odds of smoking cigarette as compared to their counterparts. It agrees with other studies conducted in Ethiopia, Nigeria, Gambia, Nepal, and Cambodia.<sup>10,19,27–29</sup> According to several theories such as Social Learning Theory, Social Cognitive Theory, and Social Development Models, an adolescent learns or recalls a behavior by watching his/her parents practice it. Parents who smoke in front of their children serve as role models for their children, fostering the impression that smoking is a normal adult habit. Mentally immature children would mimic their parents' smoking habits in order to satisfy their need to be like adults.<sup>30–32</sup> Prenatal nicotine exposure has also been shown to affect reward-related brain pathways, facilitating impulsive behaviors and, as a result, higher drug addiction rates, including for tobacco.<sup>33</sup> This finding implies that tobacco control programs for adolescents should include parent participation.

Having friends who smoke cigarettes was also another predictor associated with current cigarette smoking. According to our data, adolescents with smoker friends were about five times more likely to be current smokers than adolescents with nonsmoker friends. This is supported by a number of studies conducted in Ethiopia, Morocco, Madagascar, Cameroon, Republic of Korea and Jordan.<sup>28,34–38</sup> This study lends weight to theories such as social learning theory, social cognitive theory, and social development models, which contend that adolescents adopt norms, attitudes, and actions based on the sorts of peers with whom they are socialized. Being in the proximity of other smokers is now universally regarded as

**Table 2** Smoking Characteristics of the Adolescent in Gode, Eastern Ethiopia 2020 (N = 72)

Variables	Categories	Frequencies (N)	Percentage (%)
Age started cigarette	10–13	7	9.7
	13–16	39	54.2
	16–19	26	36.1
Number of cigarette per day	≤10 pcs	39	54.2
	>10pcs	33	45.8
Length of smoking	< 1 year	25	34.7
	1–3 years	40	55.6
	>3 years	7	9.7

**Table 3** Factors Associated with Cigarette Smoking (Multivariable Analysis) Among Adolescent in Gode, Eastern Ethiopia, 2020 (N = 341)

Variable	Categories	Cigarette Smoke		COR 95% CI	AOR with 95% CI
		Yes N(%)	No N(%)		
Marital status	Married	12(27.9)	31(72.1)	1.54(0.74–3.17)	1.30(0.55–3.08)
	Not married	60(20.1)	238(79.9)		
Educational of the person	No formal education	19(30.2)	44(69.8)	1.83(0.99–3.39)	1.29(0.63–2.64)
	Attended formal education	53(19.1)	225(80.9)		
Parents chew <i>khat</i>	Yes	45(29.6)	107(70.4)	2.52(1.48–4.31)	1.54(0.82–2.90)
	No	27(14.3)	162(85.7)		
Have a parents who smoke Cigarette?	Yes	54(30.5)	123(69.5)	3.56(1.98–6.39)	<b>2.57(1.32–5.02)*</b>
	No	18(11.0)	146(89.0)		
Did you Chew <i>khat</i> ?	Yes	60(36.8)	103(63.2)	8.06(4.14–15.70)	<b>6.01(2.96–12.23)*</b>
	No	12(6.7)	166(93.3)		
Ever used shisha	Yes	25(37.9)	41(62.1)	3.01(1.69–5.49)	0.59(0.24–1.44)
	No	47(17.1)	228(82.9)		
Have smoker Friends	Yes	44(41.1)	63(58.9)	5.12(2.96–8.92)	<b>4.78(2.12–10.76)*</b>
	No	28(12.0)	206(88.0)		
Believe Smoking harm health	Yes	51(18.5)	224(81.5)	1	1
	No	21(31.8)	45(68.2)		
Have you ever drink alcohol?	Yes	3(42.9)	4(57.1)	2.88(0.63–13.17)	1.67(0.29–9.75)
	No	69(20.7)	265(79.3)		

**Notes:** \*Significantly associated at a p-value < 0.005. *Khat* is a plant with fresh leaves and soft twigs with amphetamine like characteristics, with effects including insomnia, euphoria, decreased fatigue, and suppressed appetite when chewed. It is a perennial shrub whose leaves are chewed for its stimulant effect.

a good predictor of future smoking behaviors.<sup>30,31</sup> Social influence programs can help establish social norms that deter young people from starting to smoke, and peer education strategies can work in conjunction with other health promotion efforts to maximize their effectiveness.

The current study indicated that the odds of cigarette smoking are six folds higher among *khat* chewers as compared to those who do not chew *khat*. Similar findings were reported from studies conducted in Hawassa, Mekele and other parts of Ethiopia.<sup>15,39,40</sup> According to Problem Behavioral Theory, which argues that adolescents who participate in one form of harmful behavior are more likely to engage in another, such as smoking cigarettes versus chewing *khat*. This concept is predicated on the notion that a person's connection to their environment increases the likelihood of developing problem-related behavior.<sup>41</sup> There is also evidence that nicotine-induced brain alterations can occasionally impact the neurological response to other substances, raising the likelihood of addiction and prolonged usage.<sup>42</sup> This study emphasizes the necessity of a holistic intervention that targets adolescent drug use, including tobacco, *khat*, alcohol, and shisha. Furthermore,

an estimated 47.8% of the participants included in study chewed *khat*, showing that it is a common habit that should be examined in tandem to decrease adolescent tobacco usage.

## Limitations

This study has limitations since it did not involve adolescents from rural villages, and the data was gathered during a COVID-19 outbreak, which made data collecting difficult. Moreover, adolescents are normal deny their cigarette smoking behaviors due to social desirability bias and smoking status was not confirmed using biomarkers such nicotine levels in saliva or exhaled carbon monoxide, resulting in an underestimate of the correct prevalence of cigarette smoking.<sup>43</sup> Furthermore, because recall biases likely exist, the 30-day timeframe for asking youth about tobacco use is employed to limit the recall bias.

## Conclusion

The current study reported that 21.1% of adolescents in Gode smoke cigarettes, and this result is relatively higher as compared to some of the previous study done in

Ethiopia. Moreover, this study reported having smokers' parents and friends and chewing *khat* was found to be an independent predictor for cigarette smoking.

## Recommendation

Tobacco taxes should be raised, and stricter laws (and enforcement) regulating who may buy tobacco products, how and where they can be purchased should be established. Prohibiting public smoking, advertising bans, and mandatory health warnings on packs should be implemented since they are extremely beneficial. In addition, local governments recommended to apply a sales prevention policy that prohibits the sale of cigarette, *khat*, and other drugs to minors. Moreover, other studies in eastern Ethiopia are needed to help local communities, public health professionals, healthcare practitioners, and local governments to establish policies, education, and messaging for individuals who are at risk of smoking, as well as adolescents who wish to quit.

## Abbreviations

AOR, adjusted odds ratio; CI, confidence interval; WHO, World Health Organization; IHRERC, Institutional Health Research Ethics Review Committee.

## Data Sharing Statement

The datasets used for analysis are available from the corresponding author on reasonable request.

## Ethical Approval and Consent to Participate

Ethical clearance was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Medicine and Sciences, Jigjiga University. Support letters were written to all Gode town administration where the study was actually conducted. The informed, voluntary, written and signed consent was obtained from each study participant. In addition, informed, voluntary, written and signed assent was also obtained from the guardians and parents adolescents aged less than 18 years. Study participants were clearly informed about their right to withdraw/refuse at any stage of the study if they did not want to participate and confidentiality of the information was assured. The data collectors interviewed the participants in separated areas. Confidentiality of information and the privacy of participants were respected. This study was conducted in accordance with the Declaration of Helsinki.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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The authors report no conflicts of interest in this work.

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