

# Polysubstance use behavior among the male population in Ethiopia: Findings from the 2016 Ethiopia Demographic and Health Survey

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## Abstract

**Background:** Substance use is predominantly associated with male behavior and is becoming one of the major public health challenges across the globe, including in Ethiopia. The purpose of this study was to estimate the magnitude and predictors of polysubstance use behavior among males in Ethiopia.

**Methods:** Data were extracted from the 2016 Ethiopia Demographic and Health Survey (EDHS). From a total of 12,688 male participants in the EDHS, a sample was extracted of 7,931 males who used at least one substance (alcohol, khat or tobacco) during the time of the survey. Those who used more than one substance were considered as polysubstance users, which was the outcome of interest. Descriptive statistics was computed and displayed with tables and graph. Logistic regression was carried out to identify predictors of polysubstance use, and statistical significance was declared at a 95% confidence level.

**Results:** Of the total sample of 12,688 males in the 2016 EDHS, 7,931 (62.5%) were currently using at least one substance. Regional distribution of current substance users shows that Amhara (18.5%), Tigray (14.2%) and Oromia (12.8%) have the highest percentage of substance users, respectively. Among the current any substance users, 15.0% use cigarettes daily or on some days – 74.7% of these are daily users. Nineteen per cent of current male substance users in Ethiopia are polysubstance users. The main substances consumed are alcohol only (53.1%), followed by khat only (25.9%). Polysubstance use behavior can be predicted by residence (urban residence: OR: 1.78; CI: 1.35, 2.34), educational status (secondary education: OR: 1.50; CI: 1.19, 1.89) and marital status (no longer living together: OR: 2.85; CI: 1.58, 5.15). Region, religion, wealth status, age, family size and media exposure are other factors significantly associated with polysubstance use behavior.

**Conclusions:** Polysubstance use behavior among males is widespread in all regions of the country. Socio-demographic factors and access to media are predictors of polysubstance use. Therefore, in addition to law enforcement such as prohibition of advertising, there is a need to investigate underlying genetic, structural, policy and behavioral determinants of polysubstance use so that holistic interventions can be designed to target multiple substance use simultaneously. [*Ethiop. J. Health Dev.* 2020; 34(3):171-180]

**Key words:** Alcohol, cigarettes, EDHS, Ethiopia, khat, males, polysubstance use, substance use

## Introduction

Polysubstance use describes the ingestion of more than one drug of abuse within a defined period. Substance use refers to the consumption of alcohol or drugs. Substance abuse is the harmful or hazardous use of psychoactive substances, including alcohol and illicit drugs, that leads to addiction or ‘dependence’ (1-4). Polysubstance use describes the ingestion of more than one drug of abuse within a defined period (4).

The use of substances is becoming a major public health problem worldwide (5). The extent of worldwide psychoactive substance use is estimated at 2 billion alcohol users, 1.3 billion smokers and 185 million other drug users (6). Such substance use is an important contributor to the global burden of diseases: alcohol and tobacco use contribute about 5.4% and 3.7% to the global burden of disease, respectively (7). In 2015, the magnitude of harm caused by drug use globally was estimated to be 28 million lost years of ‘healthy’ life (disability-adjusted life years (DALYs)) (8,9). Polysubstance use among substance users is common. The pooled prevalence of simultaneous (refers to “two or more substances used on the same occasion with overlapping consumption/effects”) and concurrent (refers to “two or more substances used within a specified period; e.g past 30 days”) use of alcohol among cocaine users is 74% and 77%,

respectively (4). Alcohol, cannabis and khat are the most common substances of abuse in Africa (5).

In Ethiopia, alcohol, khat and tobacco are the most common substances consumed (10,11). The overall pooled prevalence of ever and current substance use is 33.84% and 25.2%, respectively, among the youth population of Ethiopia. Of the substances used, alcohol is the main product consumed (33.95%), followed by khat (24.82%) and cigarettes (18.53%) (11). In a community survey in Ethiopia, 4.2% of the adult population used tobacco products, and heavy episodic drinking and khat chewing were significantly associated with tobacco use (12). Polysubstance use behaviour is found among 39.3% of undergraduate students in one of the universities in Ethiopia (13).

Substance use behavior is more prominent in males than females. The lifetime and current substance use is 3.2 and 2.8 times higher among males compared to females (11). According to the 2016 Ethiopia Demographic and Health Survey (EDHS), 4% of males in Ethiopia smoke any type of tobacco, and almost all are cigarette smokers. Among males who smoke cigarettes daily, one quarter (25%) smoke five to nine cigarettes each day; 6% smoke 25 or more cigarettes each day. About half of Ethiopian males (46%) have reported drinking alcohol at some point in their lives.

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Of those male respondents interviewed who ever drank alcohol, 58% drank on six or more days in the preceding 30 days, and 9% consumed alcoholic drinks almost every day over the same timeframe. The 2016 EDHS also show that 27% of males report having ever chewed khat. Among respondents who ever chewed khat, two thirds chewed khat for six or more days in the past 30 days (14).

According to different studies conducted in Ethiopia, similar factors have been mentioned to explain khat, tobacco and alcohol use behaviours. These include family history of substance use, peer pressure, poor wealth quintile, employment/unemployment, stressful life events, celebrations and addiction (15-18). Among the young segment of the Ethiopian population, college and university students are at the highest risk of substance use (10). Joining university often leads to new opportunities, independence from family control, self decision-making, and peer pressure to use or abuse drugs (16).

Many studies have reported different reasons for substance use. Substance use is sometimes referred to as an important part of social and cultural constructs. Other perceived reasons for substance use include improved well-being, euphoria, excitement, social participation, increased alertness, relief from stress, increased ability to concentrate, and addiction (19,20). However, substance use has different negative adverse effects on human health related to long-term use. Withdrawal symptoms are observed in users, such as feeling depressed, mood disturbance, craving, feeling fatigued, increased appetite, irritability, restlessness, and loss of motivation and concentration (21,22).

Polysubstance use is more related to overdose and risky behaviour compared to single substance use (23,24). It might also be linked to an increased risk of non-communicable diseases (12). Furthermore, substance use has been found to be a likely cause of both risky sexual and violent behaviour (25,26). The International Narcotics Control Board in its 2013 report showed that the socio-economic impact of substance use includes the cost of drug prevention and treatment, drug-affected driving, impact on the environment, and costs related to labour non-participation/decreased productivity (9). The United Nations Sustainable Development Goal 3.5 aims to 'strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful alcohol use' (27). Global trends and projections for tobacco use reveal that only 37 (21%) countries are on track to achieve their targets, and globally there will be an estimated 1.1 billion tobacco smokers by 2025. Moreover, a rapid increase in smoking rates is predicted among males in Africa (28).

In summary, substance use poses a significant threat to the health, social and economic fabric of families, communities and nations. Besides, polysubstance use amplifies the effect of single substance use. Substance use among the female population in Ethiopia is reported to be insignificant compared to the male population. This may indicate under-reporting due to a

greater stigma of substance use for females, or social desirability bias. In the current study, since the sample for current female substance users was not adequate and the problem is more prominent in males, only male substance users were included in the analysis. To the best of our knowledge, there is no study with a nationally representative sample of males from the community that identifies the level of polysubstance use and its predictors in Ethiopia. Therefore, the aim of this study was to measure the magnitude and predictors of polysubstance use behavior among the Ethiopian male population using the 2016 EDHS data.

### Methods

Data for this study came from the 2016 EDHS, the fourth survey implemented by the Central Statistical Agency (CSA). CSA conducted the survey in collaboration with the Federal Ministry of Health (FMOH) and the Ethiopian Public Health Institute (EPHI), with technical assistance from ICF International, and financial and technical support from development partners. The 2016 EDHS was conducted from January 18, 2016, to June 27, 2016, based on a nationally representative sample that provides estimates at the national and regional levels, and for urban and rural areas.

### Sample

The sampling frame used for the 2016 EDHS is the Ethiopia Population and Housing Census (PHC), which was conducted in 2007 by the CSA. The census frame is a complete list of 84,915 enumeration areas (EAs) created for the 2007 PHC. An EA is a geographic area covering an average of 181 households.

All women aged 15-49 and all males aged 15-59 who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed for the 2016 EDHS. However, only the male population data was used for this study. For the 2016 EDHS, a total of 14,795 eligible males was identified in the sampled households, and 12,688 were successfully interviewed, yielding a response rate of 86%. Therefore, 12,688 males is the final sample size of this study. For this particular analysis, we extracted 7,931 males who currently use at least one substance (alcohol, khat or tobacco) from the 12,688 total national male participants of the EDHS.

### Measures

In addition to the socio-demographic data, behavioral data such as substance use was extracted from the data set. The EDHS measured current use of tobacco using a single item: '*Do you currently smoke or use any other type of tobacco every day, some days, or not at all?*' Accordingly, anyone who reported every day or some days was considered as a current smoker. Khat chewing and alcohol use behaviors were also measured using the following single items: '*During the last 30 days, how many days did you chew khat?*' and '*During the last 30 days, how many days did you have a drink that contains alcohol?*' In both cases, anyone who reported at least one day of use in the previous 30 days was considered as current khat or alcohol user. As a

result, those individuals who were currently using at least one of the three substances based on the above measurement were considered as current substance users and were included in the analysis. Finally, those who were currently using two or three of the substances were considered as polysubstance users.

Access to media was computed using the frequency of reading newspapers/magazines, listening to the radio, watching television, internet use, and mobile phone ownership. To measure literacy, respondents were shown a full sentence to read and were categorized as 'cannot read', 'able to read only parts of sentence', 'able to read whole sentence', 'no card with required language' to read for the participant during the data collection period and 'blind/visually impaired'. In addition to the above measures, socio-demographic characteristics – such as age, wealth index, marital status, ethnicity, residency, educational status, region, religion and employment status – were included in the study.

### Statistical analyses

The data extraction and analysis for this study was done using SPSS software. After data preparation for analysis, descriptive analysis was done to determine the socio-demographic characteristics and polysubstance use behaviour of the respondents. In addition, data were presented in tables and a figure (see below). Bivariate logistic regression was used to look for the presence of association between lists of socio-demographic characteristics and polysubstance use behavior. Following identification of polysubstance use behaviour as a dependent variable, multiple binary

logistic regression models were used to assess the association between the dependent variable and independent variables by controlling for the effect of confounding variables. A P-value of less than 0.05 was taken as a cut-off point to measure the level of statistical significance. The degree of association was presented using point estimate and 95% CI odds ratios.

### Ethics

Permission to use the EDHS data set was obtained from the DHS program.

### Results

#### 1. Background characteristics

##### 1.1 Regional distribution of current smokers

Of the total sample of males (12,688) in the 2016 EDHS in Ethiopia, 7,931 (62.51%) were currently using at least one substance (alcohol, khat or tobacco). As a result, 7,931 male current substance users were included in the present study.

The within region distribution of substance users indicated that Tigray (88.68%), Amhara (87.06%) and Harari (80.03%) had the leading proportion of substance users, respectively. The Among region distribution of current substance users showed that Amhara (18.5%), Tigray (14.2%) and Oromia (12.8%) had the top three highest proportions of substance users, respectively. Similarly, more current substance users were reported among rural residents compared with their urban counterparts, both in the case of the within substance distribution and among the total male sample distribution. (see Table 1).

**Table 1: Regional and urban/rural distribution of male substance users in Ethiopia, 2016**

Characteristics	Total male regional sample	Current substance users	Within region %	Among region %
<b>Region/City</b>				
Amhara	1,684	1,466	87.06	18.5
Tigray	1,272	1,128	88.68	14.2
Oromia	1,718	1,016	59.14	12.8
Addis Ababa	1,232	788	63.96	9.9
Dire Dawa	902	620	68.74	7.8
Benishangul-Gumuz	981	602	61.37	7.6
Harari	681	545	80.03	6.9
SNNPR	1,607	536	33.35	6.8
Gambella	868	469	54.03	5.9
Somali	1,012	462	45.65	5.8
Afar	731	299	40.90	3.8
<b>Total</b>	<b>12,688</b>	<b>7,931</b>	<b>100.00</b>	<b>100.00</b>
<b>Type of place of residence</b>				
Urban	3,866	2,394	61.93	30.2
Rural	8,822	5,537	62.76	69.8

#### 1.2 Socio-demographic characteristics

About one third – 2,463 (31.1%) – of the current substance users (alcohol, khat or tobacco) had never attended school. The majority were Orthodox Christians (57.0%), and 31.3% were in the Amhara ethnic group; 61.5% were married, and 33.1% had never married. Only 11.9% of the current substance users were not currently working or unemployed.

About half of them (48.8%) were in the 'rich' or 'richest' wealth index categories (Table 2). The mean age of the study participants was 32.43 (SD=11.22), with the minimum aged 15 and the maximum aged 59. The family size of the study participants ranged from one to 19, with an average of 5.24 individuals (SD=2.46).

**Table 2: Socio-demographic characteristics of male substance users in Ethiopia, 2016 (n=7,931)**

Characteristics	Frequency	%
<b>Educational level</b>		
No education	2,463	31.1
Primary	3,177	40.1
Secondary	1,260	15.9
Higher	1,031	13.0
<b>Religion</b>		
Orthodox	4,524	57.0
Catholic	66	0.8
Protestant	396	5.0
Muslim	2,876	36.3
Traditional	25	0.3
Other	44	0.6
<b>Ethnicity</b>		
Amhara	2,485	31.3
Oromo	1,966	24.8
Tigray	1,272	16.0
Afar	218	2.7
Somali	534	6.7
Gurage	323	4.1
Others	1,133	14.3
<b>Current marital status</b>		
Never married	2,623	33.1
Married	4,880	61.5
Living with partner	140	1.8
Widowed	43	0.5
Divorced	186	2.3
No longer living together/separated	59	0.7
<b>Currently working</b>		
No	942	11.9
Yes	6,989	88.1
<b>Wealth index</b>		
Poorest	1,718	21.7
Poor	1,226	15.5
Middle	1,123	14.2
Rich	1,154	14.6
Richest	2,710	34.2

## 2. Substance use behavior

Among the current 'any substance users', 15.0% were using cigarettes daily or on some days; of these, around

Of those males who currently use substances, one fifth (19%) were polysubstance users (i.e. were using more than one substance – khat, alcohol or cigarettes). The

three quarters (74.7%) were daily users. Of the total current 'any substance users', 1.6% were former smokers (see Table 3).

main substances consumed were alcohol only (53.1%), followed by khat only (25.9%) (see Figure 1 and Table 3).

Table 3: Substance use behavior among male substance users in Ethiopia, 2016 (n=7,931)

Characteristics	Frequency	%
<b>Currently smoke cigarettes</b>		
Do not smoke	6,742	85.0
Every day	888	11.2
Some days	301	3.8
<b>In the past smoked cigarettes or used other type of tobacco</b>		
Do not smoke	7,805	98.4
Every day	48	0.6
Some days	77	1.0
<b>In the past smoked tobacco every day (n=301)</b>		
No	180	59.8
Yes	121	40.2
<b>Ever chewed khat</b>		
No	4,215	53.1
Yes	3,668	46.2
Missing	48	0.6
<b>Currently using khat</b>		
No	4,548	57.3
Yes	3,383	42.7
<b>Ever took a drink that contains alcohol</b>		
No	2,727	34.4
Yes	5,152	65.0
Missing	52	0.7
<b>Currently using alcohol</b>		
No	2,867	36.1
Yes	5,064	63.9
<b>Number of days took alcohol in the past 12 months</b>		
Almost every day	443	5.6
At least once a week	2,760	34.8
Less than once a week	1,865	23.5
None in the last 12 months	87	1.1
Missing	2,776	35.0
<b>Substance use category</b>		
Only one substance use	6,425	81.0
Any two substance use	1,306	16.5
Three substance use	200	2.5
<b>Polysubstance use</b>		
Yes	1,506	19.0
No	6,425	81.0

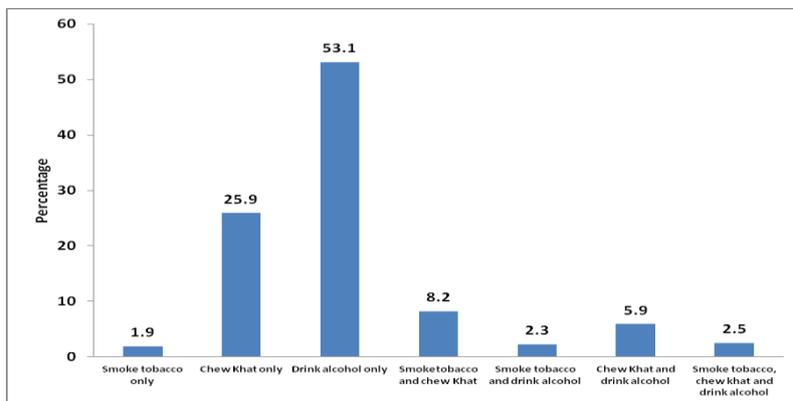


Figure 1: Patterns of current substance use among males in Ethiopia, 2016

**3. Predictors of polysubstance use behavior**

Eleven variables that showed statistically significant association in the crude analysis were entered into multivariate analysis to identify independent predictors of polysubstance use behavior. Compared with substance users in Tigray Region, all other regions' substance users were more likely to be polysubstance users. Dire Dawa [30.23, 95% CI (16.10, 56.40)] and Somali Region [40.36, 95% CI (19.69, 82.73)]

substance users were the most likely to be poly substance users. Urban residents were 1.78 times [95% CI (1.35, 2.34)] more likely to be polysubstance users compared with rural residents. Polysubstance use behavior was significantly associated with those who had completed primary [1.36, 95% CI (1.16, 1.65)] and secondary education [1.50, 95% CI (1.19, 1.89)], compared with those who were illiterate. Muslims [(1.35, 95% CI (1.13, 1.62)] and Protestants [1.37, 95%

CI (1.03, 1.81)] were more significantly associated with polysubstance use behavior compared with Orthodox Christian followers. Those substance users in the 'rich' [0.53, 95% CI (0.41, 0.69)] and 'richest' [0.64, 95% CI (0.47, 0.88)] wealth index categories were less likely to be polysubstance users compared with those who were in the 'poorest' wealth index category. Compared with those who were had never been married, participants who had divorced [1.87, 95% CI (1.23, 2.83)] or were no longer living together

[2.85, 95% CI (1.58, 5.15)] were more likely to be polysubstance users. As age increased by a year, polysubstance use behavior increased by 3% [1.03, 95% CI (1.02, 1.03)]. An increase in household family size was significantly associated with a decrease in polysubstance use behavior [0.96, 95% CI (0.93, 0.98)]. Polysubstance use behavior increased significantly when access to media increased [1.043, 95% CI (1.00, 1.08)].

**Table 4: Predictors of polysubstance use behavior among male substance users in Ethiopia, 2016 (n=7,931)**

Characteristics	Polysubstance user (n=1,506)	Monosubstance user (n=6,425)	COR (95% CI)	AOR (95% CI)
<b>Region/City</b>				
Tigray	18	1,110	Reference	Reference
Afar	80	219	22.53(13.24, 38.33)	12.26 (5.79, 25.95)
Amhara	61	1,405	2.68 (1.57, 4.56)	3.48 (1.81, 6.67)
Oromia	164	852	11.87 (7.24, 19.47)	14.42 (7.70, 26.98)
Somali	192	270	43.85(26.57, 72.38)	40.36 (19.69, 82.73)
Benishangul-Gumuz	126	476	16.32 (9.85, 27.06)	13.28 (7.10, 24.86)
SNNPR	100	436	14.14 (8.46, 23.65)	10.64 (5.59, 20.24)
Gambella	173	296	36.04(21.82, 59.55)	25.41 (13.71, 47.10)
Harari	177	368	29.66(18.01, 48.85)	27.29 (14.48, 51.43)
Addis Ababa	183	605	18.65(11.38, 30.58)	12.72 (6.10, 23.45)
Dire Dawa	232	388	36.87(22.52, 60.39)	30.23 (16.10, 56.40)
<b>Type of place of residence</b>				
Urban	660	1,734	2.11 (1.88, 2.37)	1.78 (1.35, 2.34)
Rural	846	4,691	Reference	Reference
<b>Educational level</b>				
No education	387	2,076	Reference	Reference
Primary	576	2,601	1.19 (1.03, 1.37)	1.38 (1.16, 1.65)
Secondary	296	964	1.65 (1.39, 1.95)	1.50 (1.19, 1.89)
Higher	247	784	1.69 (1.41, 2.02)	1.12 (0.87, 1.46)
<b>Religion</b>				
Orthodox	566	3,958	Reference	Reference
Catholic	18	48	2.62 (1.52, 4.54)	0.99 (0.54, 1.81)
Protestant	124	272	3.19 (2.53, 4.01)	1.37 (1.03, 1.81)
Muslim	775	2,101	2.58 (2.29, 2.91)	1.35 (1.13, 1.62)
Other (traditional/missing)	23	46	3.50 (2.10, 5.81)	1.67 (0.95, 2.94)
<b>Wealth index</b>				
Poorest	382	1,336	Reference	Reference
Poor	171	1,055	0.57 (0.47, 0.69)	0.84 (0.66, 1.05)
Middle	156	967	0.56 (0.46, 0.69)	0.84 (0.66, 1.07)
Rich	116	1,038	0.39 (0.31, 0.49)	0.53 (0.41, 0.69)
Richest	681	2,029	1.17 (1.02, 1.35)	0.64 (0.47, 0.88)
<b>Current marital status</b>				
Never married	403	2,220	Reference	Reference
Married	988	3,892	1.40 (1.23, 1.59)	0.93 (0.78, 1.11)
Living with partner	24	116	1.14 (0.73, 1.79)	0.82 (0.51, 1.33)
Widowed	12	31	2.13 (1.09, 4.19)	1.12 (0.52, 2.39)
Divorced	50	136	2.03 (1.44, 2.85)	1.87 (1.23, 2.83)
No longer living together	29	30	5.33 (3.16, 8.97)	2.85 (1.58, 5.15)
<b>Currently working</b>				
No	143	799	Reference	Reference
Yes	1,363	5,626	1.35 (1.12, 1.63)	1.24 (0.99, 1.54)
<b>Ethnicity</b>				
Amhara	317	2,168	Reference	Reference
Oromo	438	1,528	1.96 (1.67, 2.30)	0.93 (0.74, 1.17)
Tigray	66	1,206	0.37 (0.28, 0.49)	1.18 (0.80, 1.72)
Afar	62	156	2.72 (1.98, 3.73)	1.90 (1.04, 3.47)
Somali	216	318	4.65 (3.77, 5.73)	0.98 (0.63, 1.51)
Gurage	71	252	1.93 (1.44, 2.57)	0.83 (0.60, 1.14)
Other	336	797	2.88 (2.42, 3.43)	1.74 (1.35, 2.23)
<b>Age (mean, SD)</b>	34.51 (10.06)	31.94 (11.42)	1.02 (1.02, 1.03)	1.03 (1.02, 1.03)
<b>Household size (mean, SD)</b>	4.95 (2.58)	5.31 (2.42)	0.94 (0.92, 0.96)	0.96 (0.93, 0.98)
<b>Access to media (mean, SD)</b>	3.25 (2.45)	2.84 (2.31)	1.08 (1.05, 1.10)	1.04 (1.00, 1.08)

## Discussion

This study was conducted with males, as evidence from Ethiopia and elsewhere shows that the magnitude of substance use is higher among males compared to females (14,29-33). We have tried to identify predictors of polysubstance use among males who have used at least one substance, since they are at increased risk of being polysubstance users (11,23,34,35). Evidence shows that there is a gender difference in the epidemiology of substance use and its consequences (36). Moreover, favorable social attitudes towards substance use by males compared to females could also be one of the reasons for the higher level of substance use among males than females (37,38).

Among the respondents 7,931 (62.51%) of 12,688 males were currently using at least one substance (alcohol, khat or tobacco), which is higher than a review conducted in sub-Saharan Africa (39). This might be attributed to the difference in the age of participants in the two studies. The prevalence of substance use is also lower than the previous EDHS report, conducted in 2011 (40). A study on smoking prevalence in a nationally representative sample in Ethiopia (29) shows that the level of smoking increased from 2005 to 2011.

Our study pointed out that the majority of the respondents reported that they had used substances almost every day in a month preceding the survey. Manufactured cigarettes were the most common tobacco product consumed in Ethiopia, which is consistent with a study conducted in 49 countries using demographic survey data (41). Ease of access to manufactured cigarettes from shops and markets might be the reason for the lion's share of tobacco products used. The most common substance used in Ethiopia was alcohol only (53.1%), which is consistent with other reviews conducted in Ethiopia (11,42), whereas the most common substance used in Bangladesh (31), USA (43,44) and Morocco (45,46) was tobacco. The difference could be related to the measurement used to assess alcohol, as our study included local drinks such as *tej* and *tella*, which are commonly drunk in Ethiopia (47).

About 19% of the respondents were polysubstance users, which is inconsistent with studies conducted in the USA (43), Scotland (48) and UAE (49), where most of the participants were polysubstance users. It is also lower than a previous study conducted in Ethiopia (13). The discrepancy in magnitude can be explained in relation to characteristics of participants, accessibility of the substances, and social desirability bias, as in some parts of the country it may be a taboo to disclose substance use. Moreover, most injectable substances which are not readily available, might limit the variety of substances used.

There is a variation in substance use in regions of the country. There are higher proportions of users in the regions of Amhara (87.06%) and Tigray (88.68%), where *tella* and *tej* are the most commonly consumed

alcoholic drinks. Similarly, there are higher proportions of substance users in Harari Region due to the high consumption of khat (50).

The odds of being a polysubstance user in our study was higher in Dire Dawa and Somali Region, where there is higher level of tobacco use (12,51). Those who live in urban areas had an increased probability of being a polysubstance user, as urbanization is one of the factors contributing to high tobacco use (29), where manufactured cigarettes are easily accessible and exposure to advertisements is higher.

Educational and marital status were other independent predictors of polysubstance use. Contrary to their expected level of knowledge, those males who completed primary or secondary education had higher odds of being polysubstance users compared to people who were illiterate, which is in line with studies conducted in the USA (52), Ethiopia and Kenya (29). On the other hand, since those educated in Ethiopia are mostly at younger age, they might be vulnerable to substance use behavior due to curiosity, peer pressure, fun as evidenced by other study (31). Those males who were divorced and no longer living with their spouses had a higher probability of being polysubstance user, which could be related to their opportunity to start a new type of substance, as they tolerate the previous one, as a coping mechanism for their loneliness, or one of the reasons for their divorce/separation. On the other hand, they were no longer 'under the control of their partner', which might lead them to engage in a new behavior of substance use (53).

In line with studies in Kenya (29) and Ethiopia (18), those substance users in the highest wealth index category had lower odds of polysubstance use compared to poorest wealth index category. As age increases by a year, the odds of polysubstance use behavior increased by 3%; in effect, the probability of being exposed to other types of substance is higher as people live longer and have new life experience (54,55).

Increase in household family size led to decreased odds of polysubstance use, as the expenditure could be shared with family members and there might not be extra money to spend on additional substances. Access to media was one of the factors which increased the odds of polysubstance use – exposure to advertisements for a product might increase the curiosity to try it.

## Limitations of the study

Even though our study was conducted in nationally representative large sample, it had some limitations related to secondary data analysis and participants of the survey. First, the predictors determined were on the factors studied in the survey and there might be residual confounding factors, such as a genetic component, that we were unable to control. Second, there might be denial of use, as the response to substance use was based on respondents self-reports,

and in some communities substance use might be associated with stigma. Third, all the substances are not addressed in this particular study; the focus was only on the common substances used. Therefore, these issues should be borne in mind when using the findings of this study.

### Conclusions

The prevalence of polysubstance use behavior in Ethiopian males is alarming and widespread across all regions of the country. The most common substance used was alcohol. There was a variation in polysubstance use behavior according to socio-demographic and behavioral factors. Geographic, demographic, economic and media exposure predicted polysubstance use. Thus, it is better to study with holistic approach to further investigate the underlying structural, policy and behavioral determinants, and it could also be important to study the genetic predisposition of those who are at increased risk of polysubstance use behavior. Moreover, the law restricting the advertisement of substances in the media should be enforced.

### Availability of data and material

The datasets generated and/or analyzed during the current study are available in the DHS repository: <https://dhsprogram.com/what-we-do/survey/survey-display-478.cfm>.

### Competing interests

The authors declare that they have no competing interests.

### Authors' contributions

EG and BK conceived and designed the study. EG and BK analyzed and interpreted the data. TM, EG and BK contributed to the discussion. TM and BK wrote the manuscript. All authors read and approved the final manuscript.

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### References

1. Crozer-Keystone. Substance use, abuse and dependence. News release. March 27, 2017. [www.crozerkeystone.org/news/news-releases/2017/substance-use-abuse-and-dependence/](http://www.crozerkeystone.org/news/news-releases/2017/substance-use-abuse-and-dependence/)
2. American Addiction Centers. Polysubstance use and abuse: The unique treatment needs of polydrug users. February 3, 2020. <https://americanaddictioncenters.org/polysubstance-abuse>.
3. World Health Organization. Substance abuse. [www.who.int/topics/substance\\_abuse/en/](http://www.who.int/topics/substance_abuse/en/).
4. Liu Y, Williamson V, Setlow B, Cottler LB, Knackstedt LA. The importance of considering polysubstance use: Lessons from cocaine research. *Drug and Alcohol Dependence*. 2018;192:16-28.
5. Odejide AO. Status of drug use/abuse in Africa: A review. *International Journal of Mental Health and Addiction*. 2006;4(2):87-102.
6. French Intensive Care Society, International congress - Réanimation 2016. *Ann Intensive Care*. 2016;6(Suppl 1):50.
7. Vos T, Murray CJL, Gakidou E. The global burden of disease attributable to alcohol and drug use in 195 countries and territories, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Psychiatry*. 2018;5(12):987-1012.
8. United Nations Office on Drugs and Crime. *World Drug Report 2017*. 2017. [www.unodc.org/wdr2017/index.html](http://www.unodc.org/wdr2017/index.html)
9. International Narcotics Control Board. Report 2013. [www.incb.org/documents/Publications/AnnualReports/AR2013/English/AR\\_2013\\_E.pdf](http://www.incb.org/documents/Publications/AnnualReports/AR2013/English/AR_2013_E.pdf)
10. Teferra S. Substance use among university students in Ethiopia: A systematic review and meta-analysis. *Ethiopian Journal of Health Development*. 2018;32(4):265-77.
11. Kassa GM, Abajobir AA. A meta-analytic review of gender disparity in the magnitude of substance use among young people in Ethiopia. *Ethiopian Medical Journal*. 2019;57(4):295-307.
12. Defar A, Getachew T, Teklie H, Bekele A, Gonfa G, Gelibo T, *et al*. Tobacco use and its predictors among Ethiopian adults: A further analysis of Ethiopian NCD STEPS survey-2015. *Ethiopian Journal of Health Development*. 2017;31(1):331-9.
13. Reta Y, Samuel T, Mekonnen M. Mental distress and associated factors among undergraduate engineering students of Hawassa University, Ethiopia. *Journal of Multidisciplinary Healthcare*. 2020;13:99-107.
14. Central Statistical Agency (CSA) [Ethiopia] and ICF. *Ethiopia Demographic and Health Survey 2016: Key Indicators Report*. Addis Ababa, Ethiopia, and Rockville, Maryland, USA. CSA and ICF, 2016.
15. Lakew Y, Haile D. Tobacco use and associated factors among adults in Ethiopia: Further analysis of the 2011 Ethiopian Demographic and Health Survey. *BMC Public Health*. 2015;15:487.
16. Deressa W, Azazh A. Substance use and its predictors among undergraduate medical students of Addis Ababa University in Ethiopia. *BMC Public Health*. 2011;11:660.
17. Teshome D, Gedif T. Determinants of alcohol drinking and its association with sexual practices among high school students in Addis Ababa, Ethiopia: Cross sectional study. *Open Journal of Preventive Medicine*. 2013;3(6):420-7.
18. Akalu TY, Baraki AG, Wolde HF, Lakew AM, Gonete KA. Factors affecting current khat chewing among male adults 15–59 years in Ethiopia, 2016: A multi-level analysis from Ethiopian Demographic Health Survey. *BMC Psychiatry*. 2020;20(1):1-8.

19. Odejide AO. Status of drug use/abuse in Africa: A review. *International Journal of Mental Health and Addiction*. 2006;4(2):87-102.
20. Pengpid S, Peltzer K. Prevalence and psychosocial correlates of illicit drug use among school-going adolescents in Thailand. *Journal of Social Sciences*. 2013;34(3):269-75.
21. Mihretu A, Teferra S, Fekadu A. What constitutes problematic khat use? An exploratory mixed methods study in Ethiopia. *BioMed Central*. 2017;12:17.
22. Abdeta T, Tolessa D, Adrojan K, Abera M. Prevalence, withdrawal symptoms and associated factors of khat chewing among students at Jimma University in Ethiopia. *BMC Psychiatry* 2017;17:141.
23. Schneider KE, Park JN, Allen ST, Weir BW, Sherman SG. Patterns of polysubstance use and overdose among people who inject drugs in Baltimore, Maryland: A latent class analysis. *Drug and Alcohol Dependence*. 2019;201:71-7.
24. Berhan Y, Hailu D, Alano A. Polysubstance use and its linkage with risky sexual behavior in university students: Significance for policy makers and parents. *Ethiopian Medical Journal*. 2013;51(1):13-23.
25. Abebe W. Prevalence and consequences of substance use among high school and college students in Ethiopia: A review of the literature. *African Journal of Drug & Alcohol Studies*. 2013;12(2):107-18.
26. Floyd LJ, Hedden S, Lawson A, Salama C, Moleko AG, Latimer W. The association between poly-substance use, coping, and sex trade among black South African substance users. *Substance Use & Misuse*. 2010;45(12):1971-87.
27. Osborn D, Cutter A, Ullah F. Universal Sustainable Development Goals. Understanding the transformational challenge for developed countries. Stakeholder Forum; 2015. [https://urbandrum.co.uk/stakeholder-wordpress/wp-content/uploads/2018/05/SF\\_-\\_SDG\\_Universality\\_Report\\_-\\_May\\_2015.pdf](https://urbandrum.co.uk/stakeholder-wordpress/wp-content/uploads/2018/05/SF_-_SDG_Universality_Report_-_May_2015.pdf)
28. Bilano V, Gilmour S, Moffiet T, d'Espaignet ET, Stevens GA, Commar A, *et al*. Global trends and projections for tobacco use, 1990–2025: An analysis of smoking indicators from the WHO Comprehensive Information Systems for Tobacco Control. *The Lancet*. 2015;385(9972):966-76.
29. Tang S, Bishwajit G, Luba T, Yaya S. Prevalence of smoking among men in Ethiopia and Kenya: A cross-sectional study. *International Journal of Environmental Research and Public Health*. 2018;15(6):1232.
30. Sharifi H, Sadr M, Emami H, Ghanei M, Eslaminejad A, Radmand G, *et al*. Prevalence of tobacco use and associated factors in Tehran: Burden of Obstructive Lung Disease study. *Lung India*. 2017;34(3):225-31.
31. Maruf MM, Khan MZR, Jahan N. Pattern of substance use: Study in a de-addiction clinic. *Oman Medical Journal*. 2016;31(5):327-31.
32. Jones CM, Logan J, Gladden RM, Bohm MK. Vital signs: Demographic and substance use trends among heroin users—United States, 2002–2013. *Morbidity and Mortality Weekly Report*. 2015;64(26):719-25.
33. Sepehrmanesh Z, Ahmadvand A, Moraveji A. Comorbidity and pattern of substance use in hospitalized psychiatric patients. *Iranian Red Crescent Medical Journal*. 2014;16(8):e19282.
34. Sutter ME, Everhart RS, Miadich S, Rudy AK, Nasim A, Cobb CO. Patterns and profiles of adolescent tobacco users: Results from the Virginia Youth Survey. *Nicotine and Tobacco Research*. 2018;20(Suppl 1):S39-S47.
35. Center for Behavioral Health Statistics and Quality. 2016 National Survey on Drug Use and Health: Detailed tables. Substance Abuse and Mental Health Services Administration, Rockville,MD;2017. [www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2016/NSDUH-DetTabs-2016.pdf](http://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2016/NSDUH-DetTabs-2016.pdf)
36. Tuchman E. Women and addiction: The importance of gender issues in substance abuse research. *J Addict Dis*. 2010;29(2):127-38.
37. Birhanu AM, Bisetegn TA, Woldeyohannes SM. High prevalence of substance use and associated factors among high school adolescents in Woreta Town, northwest Ethiopia: Multi-domain factor analysis. *BMC Public Health*. 2014;14:1186.
38. Atwoli L, Mungla PA, Ndung'u MN, Kinoti KC, Ogot EM. Prevalence of substance use among college students in Eldoret, western Kenya. *BMC Psychiatry*. 2011;11(1):1-9.
39. Olawole-Isaac A, Ogundipe O, Amoo EO, Adeloye D. Substance use among adolescents in sub-Saharan Africa: A systematic review and meta-analysis. *South African Journal of Child Health*. 2018;12(2 Suppl 1):S79-S84.
40. Central Statistical Agency (CSA). Demographic and Health Survey 2011. Addis Ababa: Ethiopia and Calverton, Maryland, USA: CSA and ORC Macro; 2011.
41. Ansara DL, Arnold F, Kishor S, Hsia J, Kaufmann R. Tobacco use by men and women in 49 countries with demographic and health surveys: DHS Program; 2013. <https://dhsprogram.com/pubs/pdf/CR31/CR31.pdf>.
42. Ayano G, Yohannis K, Abraha M, Duko B. The epidemiology of alcohol consumption in Ethiopia: A systematic review and meta-analysis. *Substance Abuse Treatment, Prevention, and Policy*. 2019;14(26):1-16.
43. Grov C, Kelly BC, Parsons JT. Polydrug use among club-going young adults recruited through time-space sampling. *Subst Use Misuse*. 2009;44(6):848-64.
44. Richter KP, Ahluwalia HK, Mosier MC, Nazir N, Ahluwalia JS. A population-based study of

- cigarette smoking among illicit drug users in the United States. *Addiction*. 2002;97(7):861-9.
45. Laraqui O, Laraqui S, Manar N, Ghailan T, Deschamps F, Laraqui CH. Prevalence of consumption of addictive substances amongst Moroccan fishermen. *Int Marit Health*. 2017;68(1):19-25.
  46. Laraqui O, Manar N, Laraqui S, Ghailan T, Charioui S, Deschamps F, *et al*. Prevalence of consumption of psychoactive substances amongst dockers. *Int Marit Health*. 2018;69(2):118-25.
  47. Lee M, Regu M, Seleshe S. Uniqueness of Ethiopian traditional alcoholic beverage of plant origin, tella. *Journal of Ethnic Foods*. 2015;2(3):110-4.
  48. Riley SC, James C, Gregory D, Dingle H, Cadger M. Patterns of recreational drug use at dance events in Edinburgh, Scotland. *Addiction*. 2001;96(7):1035-47.
  49. Alblooshi H, Hulse GK, El Kashef A, Al Hashmi H, Shawky M, Al Ghaferi H, *et al*. The pattern of substance use disorder in the United Arab Emirates in 2015: Results of a National Rehabilitation Centre cohort study. *Subst Abuse Treat Prev Policy*. 2016;11(1):19.
  50. Reda AA, Moges A, Biadgilign S, Wondmagegn BY. Prevalence and determinants of khat (*Catha edulis*) chewing among high school students in eastern Ethiopia: A cross-sectional study. *PLoS One*. 2012;7(3):e33946.
  51. Guliani H, Gamtessa S, Çule M. Factors affecting tobacco smoking in Ethiopia: Evidence from the demographic and health surveys. *BMC Public Health*. 2019;19(1):938.
  52. Miech RA, O'Malley PM, Johnston LD, Patrick ME. E-cigarettes and the drug use patterns of adolescents. *Nicotine Tob Res*. 2016;18(5):654-9.
  53. Edwards AC, Larsson Lönn S, Sundquist J, Kendler KS, Sundquist K. Associations between divorce and onset of drug abuse in a Swedish national sample. *American Journal of Epidemiology*. 2018;187(5):1010-8.
  54. Bracken BK, Rodolico J, Hill KP. Sex, age, and progression of drug use in adolescents admitted for substance use disorder treatment in the northeastern United States: Comparison with a national survey. *Subst Abuse*. 2013;34(3):263-72.
  55. Richmond-Rakerd LS, Slutske WS, Wood PK. Age of initiation and substance use progression: A multivariate latent growth analysis. *Psychol Addict Behav*. 2017;31(6):664-75.