


BMJ Open Geographical variation and correlates of substance use among married men in Ethiopia: spatial and multilevel analysis from Ethiopian Demographic and Health Survey 2016

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ABSTRACT

Objective The use of substances has become one of the world's most serious public health and socioeconomic issues. Most nations in sub-Saharan Africa, including Ethiopia, are undergoing significant economic transitions, creating a favourable environment for socially destructive substance use. This study aimed to determine the geographical variation, prevalence and correlates of substance use among ever-married men in Ethiopia.

Design A community-based cross-sectional survey was undertaken from 18 January 2016 to 27 June 2016.

Data source Data were used from the 2016 Ethiopian Demographic and Health Survey (EDHS).

Data extraction and analysis Data from the 2016 EDHS was used, and a total of 7793 ever-married men were involved in the analysis. The spatial autocorrelation statistic (Global Moran's I) was used to determine whether substance use was dispersed, clustered or randomly distributed. A multilevel logistic regression model was used to identify the correlates with substance use, and statistical significance was declared at $p < 0.05$ and 95% CI.

Results Of all ever-married men, 72.5% (95% CI 71.5% to 73.4%) were currently using at least one of the three substances (alcohol, cigarettes and chat). The highest hotspot areas of substance use were observed in Ahmara and Tigray regions. The age (adjusted OR, AOR 1.80; 95% CI 1.32 to 2.45), educational status (AOR 0.64; 95% CI 0.51 to 0.82), occupation (AOR 1.36; 95% CI 1.05 to 1.76), watching television (AOR 1.50; 95% CI 1.25 to 1.81) and living in the city (AOR 2.25; 95% CI to 1.36 to 3.74) were individual and community-level correlates found to have a statistically significant association with substance use.

Conclusion In this study, nearly three-fourths of married men used one of the three substances. Given these findings, it is critical to reducing the problem by improving modifiable individual-level variables such as educational status and reducing substance advertising.

INTRODUCTION

The continued use of alcohol, tobacco, chat, caffeine, illegal narcotics and inhalants with negative consequences is referred to as

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study used a nationally representative large sample size.
- ⇒ The study considered the most frequently used substances like alcohol, cigarettes and chat.
- ⇒ The frequency and dose of substances consumed were not considered in the study.
- ⇒ The clinical characteristics and the effects of addiction to these substances were not measured.
- ⇒ The extent of substance usage was determined through self-reported.

substance use. Problematic substance use is defined as having a strong desire to use the substance, having difficulty controlling how much or how frequently the substance is used, having urges to use the substance and continuing to use the substance despite negative consequences.^{1 2} Substance abuse disorder can be caused by genes, drug action, peer pressure, emotional distress, anxiety, depression and environmental stress.^{3 4}

Globally, there are 2 billion alcohol users, 1.3 billion smokers and 185 million drug users.^{5 6} Alcohol and tobacco (cigarettes) are the most commonly used substances across all age groups and contribute significantly to the worldwide burden of diseases.⁷⁻¹⁰ Most nations in sub-Saharan Africa are undergoing significant economic, social and cultural transitions, creating a favourable environment for increased and socially destructive substance use.¹¹ Nearly 42% of people in sub-Saharan Africa used 'any substance,' with the highest percentage (55.5%) in Central Africa. Males are more likely than females to engage in substance use behaviour.^{7 12} Substance uses among young adults is associated with physical and psychosocial problems like fighting,

damage, robbery, engaging in unguarded sex, personal injury, medical problems and impaired relationships with family and friends.^{13–15}

Substance use has become one of the world's most serious public health problems, with devastating health, socioeconomic and environmental consequences.⁵ Substance use accounts for 5.4% of the global disease burden and is estimated to cost the world 28 million lost years of healthy living (disability-adjusted life-years).^{16,17} Alcohol and tobacco use have also been linked to an increased risk of chronic diseases such as cancer, chronic pulmonary disease, diabetes, accidents, violence, cancer and liver cirrhosis. On the other hand, Regular chat use causes gingivitis, tooth loss, gastrointestinal problems, cardiac complications, male impotence, insomnia and various mental health issues.^{16–20}

Prior research conducted in Ethiopia on a small and large scale found that substance use ranged from 23.86% to 62.50%.^{21–25} On the other hand, social mobility, accessibility, low wealth, low level of education, lower socioeconomic groupings, increasing age, employment and stressful life events were factors of substance use (chat, cigarettes and alcohol). Other motivations for substance use have been discovered, such as improved well-being, excitement, social participation, increased alertness, stress reduction, increased capacity to focus and addiction.^{22–28}

Substance abuse endangers people's health and their social and economic well-being.^{5, 29, 30} Ethiopia's government implemented a mandatory policy to counteract these dangers and raised taxes on regularly used substances. Alcohol advertising is now forbidden in Ethiopia, according to proclamation No. 759/2012, when the alcohol content exceeds 12%.³¹ Even though we have a proclamation to manage substance use, there is still significant difficulty with its execution and limited evidence about the extent of substance use and its correlates. To the best of our knowledge, there is no study on substance usage among Ethiopian ever-married men. Thus, this study was designed to determine the geographical variation, prevalence and correlates of substance use among ever-married men in Ethiopia using the 2016 Ethiopian Demographic and Health Survey (EDHS).

METHODS

Study setting and design

Ethiopia is Africa's second-most populated country, with 117.7 million people, and is divided into three metropolitan (city) and nine non-metropolitan regions.^{32, 33} According to the 2016 EDHS report, roughly 61.4% of the men in the study have ever-married. A community-based cross-sectional survey was undertaken from 18 January 2016 to 27 June 2016.³³

Data source and population

This study used data from the 2016 EDHS, specifically the male dataset.

Sample size and sampling methods

The entire demographic and health survey sample was designed to represent all of the country's regions and administrative cities. In the Ethiopian health and demographic survey (2016), two-phase sample procedures were used, with clusters picked in the first phase and households selected in the second.³⁴ Every region was divided into two strata: urban and rural. The sample size was then allocated using a probability proportional allocation method. The survey included around 645 clusters, with 200 from the urban and 443 from the rural. As a result, the study included a total of 7793 ever-married men, with 1262 from the urban and 6531 from the rural.

Data collection tool and quality assurance

The fundamental three data collection tools for the DHS were adopted from the demography and health survey project. These data collection tools include questions for the household, women and men.³³ The data for this study came from the men's questionnaire. The data questionnaire was written in English and then translated into the three main local languages: Amharic, Afan Oromo and Tigrigna. A pretest was conducted before data collection, and all data collectors, supervisors and quality controllers who participated in the surveys received training.

Operational definition

An ever-married man is a man who has been married at least once in their life or on the data collection date.

Substance use is defined as a self-report of exposure to at least one of the three substances (alcohol, chat, tobacco) before the interview, irrespective of its dose and frequency (yes/no).³⁵

STUDY VARIABLE AND MEASUREMENTS

Outcome variable

Substance use is the outcome variable with two categories (yes=1 when a substance is used and no=0 if no substance is used). Substance use was determined to depend on the ever-married men's self-report using a single item for each substance. 'Do you currently smoke or use any other type of tobacco every day, some days, or not at all?' As a result, anyone who reported every day or some days was taken as a current smoker. Chat chewing and alcohol use behaviours were also determined using: 'During the last 30 days, how many days did you chew chat?' and 'During the last 30 days, how many days did you have a drink that contains alcohol?' In both issues, anybody who described at least 1 day of use in the former 30 days was taken as current chat and alcohol users, respectively.³³ The prevalence of substance use was calculated by dividing the total number of substance users (obtained from a composite score of three substances) by the total number of ever-married men from the 2016 EDHS.

Independent variables

The individual and community-level independent variables were included. Individual-level variables involve men's current age (15–24, 25–34, 35–44, ≥45 years), educational status (no formal education, primary, secondary and above), religion (Christian, Muslim and others), occupation (employed, not employed), a number of living children (0, 1–2, 3–5, ≥6), wealth index (poor, middle and rich), land ownership (yes, no), housing ownership (yes, no), wife refusing sexual intercourse/sexual incompatibility (yes, no), had any sexually transmitted infection (yes, no), ever tested for HIV (yes, no), frequently watching television (TV) (not at all, at least once a week), have a bank account (yes, no). Community-level variables include place of residence (urban, rural) and regions recoded into agrarian, pastoralist and metropolises (city). The agrarian region is obtained by recoding the Tigray, Amhara, Oromia and South Nation Nationality People's Republic regions (SNNPR); the pastoralist region involves Afar, Somali, Benishangul and Gambella regions. The metropolises (city) administration regions include Harari, Addis Ababa and Dire Dawa. Residents' living stability and social change index were used to combine these regions. The regions considered a city (metropolis) have a greater social change index than other regions. The pastoral regions originated in the lowland areas of Ethiopia, mostly travelling from place to place with their cattle to find grass and water. The agrarian regions originated in the highland area of the country, in which agriculture is the principal work.

Data extraction and analysis

STATA software V.14 was used to analyse the data. The weighted samples were employed in data analysis to ensure that the survey results represented national and regional findings. In order to ensure the survey's representativeness by region and account for non-response, data were weighted using the men's data weighting variable ($mv005/10^6$) as recommended by the DHS. Using STATA 'svy' function, the analysis was also employed to describe the complex survey design and resilient standard errors (stratification and clustering). Tables and graphs were used to generate and organise descriptive statistics such as frequency and percentage. Individual and community-level variable frequencies were calculated in relation to the outcome variable. The correlates of substance use were identified using a multi-level logistic regression model. At the same time, four models were fitted to estimate the fixed influence of individual and community level correlates and the random effect of cluster fluctuations. First, the null model was run without any correlates. The effect of individual-level correlates on substance use was estimated using the second model. The third model was used to examine the effect of community-level correlates with substance use. Finally, the fourth model was run to estimate the combined effects of individual-level and community-level correlates. The proportional change in variance was computed using the

community-level variance in the null model as the denominator, which is the proportion of total community-level variance explained by individual and community-level variables. The intraclass correlation was determined to indicate random effects within a model.^{36 37} Akaike's information criterion (AIC) and Bayesian information criterion (BIC) were used for model selection. Each value of AIC and BIC in all models with the lowest value was considered.^{38 39} The median OR was calculated to indicate mysterious cluster heterogeneity.³⁶ Variables having *p* value up to 0.25 in the bivariable logistic regression analysis were considered to fit multivariable logistic regression analysis. Variance inflation factor was used to notice multicollinearity within individual-level correlates. The fixed effects of individual and community level correlates on substance use were stated using an adjusted OR (AOR) with 95% CI. Accordingly, the final model (fourth model) was used to designate the combined effect of individual and community-level correlates on substance use among ever-married men. A *p*<0.05 and an adjusted OR with 95% CIs were considered to declare statistical significance. The moderation analysis was performed to determine whether community-level variables moderated individual-level variables.

Spatial autocorrelation analysis

In this study, the spatial statistics tool used to perform the spatial analysis was ArcGIS V.10.3; Redlands, California, USA. The spatial autocorrelation statistic (Global Moran's I) was used to determine whether substance use was dispersed, clustered or randomly distributed. The cluster and outlier analyses were used to examine the spatial heterogeneity of substance use in enumeration areas as high and low. The cold and hotspot areas of substance use were indicated using the Getis-Ord G_i^* statistics and related Z-scores. Furthermore, the spatial interpolation analysis, which employs the Kriging ordinary interpolation, was used to forecast the prevalence of substance use for not sampled or unmeasured values from sampled measurements.

Patient and public involvement

None.

RESULTS

Sociodemographic characteristics of ever-married men

The analysis included a total of 7793 ever-married men from the 2016 demographic and health survey. The men's mean age (SD) was 37.3 (±9.7), and 42% of ever-married men had never attended formal education. The Oromia region had about 38% of ever-married men, and 83.8% of them lived in rural areas. Most men who had ever married had three to five living children, and 96.1% of ever-married men were actively employed (table 1).

Table 1 Sociodemographic characteristics of ever-married men in Ethiopia using 2016 DHS (n=7793)

Variables	Weighted frequency	%
Age of the respondents		
15–24	566	7.3
25–34	2745	35
35–44	2484	32
>=45	1998	25
Educational status		
No formal education	3284	42
Primary education	3179	40
Secondary and above education	1329	17
Religion		
Christian	5076	65
Muslim	2610	34
Others	106	1
Occupation		
Employed	7492	96.1
Not employed	300	3.9
No of living children		
No children	827	10.6
1–2 children	2247	28.8
3–5 children	2771	35.6
6 and above	1948	25.0
Wealth index		
Poorest	1366	17.5
Poorer	1617	20.8
Middle	1550	19.9
Richer	1584	20.3
Richest	1674	21.5
Place of residence		
Urban	1262	16.2
Rural	6530	83.8
Region		
Harari	19	0.25
Gambella	21	0.3
Dire Dawa	41	0.5
Afar	59	0.8
Benishangul Gumuz	84	1.1
Somali	208	2.7
Addis Ababa	278	3.6
Tigray	461	5.9
SNNPR	1570	20.1
Amhara	2090	26.8
Oromia	2961	38.0

*Traditional religion, 'wakefata'
DHS, Demographic and Health Survey; SNNPR, South Nation Nationality People's Republic regions.

The prevalence of substance use

In this study, one of the three substances, alcohol, cigarette and chat, was used by 72.5% (95% CI 71.5% to 73.4%) of the ever-married men. About 59.6%, 11.8% and 1.1% of ever-married men used one, two and all three substances, respectively. Alcohol (48.4%) and chat (31.9%) were the most commonly used substance by ever-married men. Almost two-thirds (73%) of ever-married men aged 25–34 years were using one of the three substances. Married men with no formal education were found to use one of the three substances at a higher rate (78.3%). In contrast, 72.8% of employed married men used one of the three substances. Besides, married men living in rural and agrarian regions used one of the three substances at a similar rate (72%) (table 2).

Spatial distribution of substance use in Ethiopia

The spatial autocorrelation analysis revealed that Ethiopia's spatial distribution of substance use was clustered. The Global Moran's I value of 0.403 ($p < 0.001$) indicated that substance use was significantly clustered in Ethiopia (online supplemental figures 1 and 2). Clusters with a high proportion of substance use were from Tigray and Amhara regions, whereas clusters with a low proportion of substance use were observed in Sidama (North, West and East) and Oromia (Southwest), Addis Ababa, Gambella and Benishangul Gumuz (figure 1).

In this study, ordinary kriging interpolation analysis was used to predict the prevalence of substance use. Accordingly, high levels of substance use were observed in Amhara, Oromia, Addis Ababa and Somali regions. On the other hand, the low substance use areas were predicted in the SNNP, Sidama and Somali regions (figure 2).

Hotspot detection of substance use

The highest proportions of substance use among ever-married men were reported from Tigray and Amhara regions. Similarly, the highest hotspot areas of substance use were observed in Tigray, Amhara, Addis Ababa, Harari and Dire Dawa regions. On the other hand, the cold spot area of substance use was seen in Benishangul Gumuz, Gambella, SNNPR, Sidama and southwest people of Ethiopia regions (figure 3).

Correlates of substance use

We have conducted a multilevel logistic regression analysis using the 2016 EDHS to identify the individual and community-level correlates with substance use. The interclass correlation in the empty model showed 52.2% variability in the prevalence of substance use among ever-married men recognised to the difference between clusters in the community. In addition, the variability among clusters in model II was 50.1%, 48.1% in model III and 47.2% in model IV. The proportion of change in the variance was 41.8% for model II (individual-level correlates), 45.4% for model III (community-level correlates) and 56.8% for model IV (combined individual-and community-level correlates), in which addition

Table 2 Multilevel bivariable logistic regression analysis of substance use among married men in Ethiopia using the 2016 EDHS (n=7793)

Variables	Substance use		COR 95% CI	P value
	Yes, n (%)	No n (%)		
Age of the respondents				
15–24	383 (67.7)	183 (32.3)	1	
25–34	1998 (72.8)	748 (27.2)	1.62 (1.25 to 2.10)	<0.001
35–44	1818 (73.2)	666 (26.8)	1.81 (1.39 to 2.35)	<0.001
≥45	1447 (72.4)	551 (27.6)	1.61 (1.23 to 2.12)	0.001
Educational status				
No formal education	2571 (78.3)	713 (21.7)	1	
Primary education	2186 (68.8)	994 (31.2)	1.13 (0.96 to 1.33)	0.157
Secondary and above education	889 (66.9)	440 (33.1)	0.89 (0.73 to 1.10)	0.290
Religion				
Christian	3548 (69.9)	1528 (30.1)	1.12 (0.91 to 1.38)	0.290
Muslim	2043 (78.3)	568 (21.8)	1.26 (1.04 to 1.54)	0.020
Others	55 (51.8)	51 (48.2)	1	
Occupation				
Employed	5454 (72.8)	2039 (27.2)	1.42 (1.10 to 1.84)	0.007
Not employed	192(64)	108(36)	1	
No of living children				
No children	671 (81.1)	157 (18.9)	0.99 (0.77 to 1.27)	0.947
1–2 children	1607 (71.5)	640 (28.5)	1.04 (0.86 to 1.25)	0.696
3–5 children	2038 (73.5)	734 (26.5)	1.23 (1.03 to 1.47)	0.021
6 and above	1331 (68.3)	617 (31.7)	1	
Wife refusing sexual intercourse				
Yes	738 (75.5)	240 (24.5)	1.64 (1.10 to 2.04)	<0.001
No	4909(72)	1907(28)	1	
Have any STI				
Yes	125 (71.0)	51(29)	0.88 (0.50 to 1.57)	0.086
No	5520 (72.5)	2096 (27.5)	1	
Ever tested for HIV				
Yes	3111 (75.5)	1007 (24.5)	1.47 (1.26 to 1.70)	<0.001
No	2535(69)	1140(31)	1	
Frequently watching television				
Not at all	2906 (67.6)	1395 (32.4)	1	
At least once a week	2741 (78.5)	752 (21.5)	1.59 (1.34 to 1.88)	<0.001
Have a bank account				
Yes	1783(78)	504(22)	1.29 (1.10 to 1.55)	0.004
No	3863 (70.2)	1643 (29.8)	1	
Wealth index				
Poor	2207(74)	778(26)	1	
Middle	1128 (72.7)	423 (27.3)	0.96 (0.77 to 1.19)	0.694
Rich	2312 (70.9)	947 (29.1)	1.20 (0.98 to 1.46)	0.073
Place of residence				
Urban	946 (74.9)	317 (25.1)	1	
Rural	4700(72)	1830(28)	0.54 (0.38 to 0.78)	0.001

Continued

Table 2 Continued

Variables	Substance use		COR 95% CI	P value
	Yes, n (%)	No n (%)		
Region				
Agrarian	5117 (72.2)	1966 (27.8)	1	
Pastoralist	235 (63.2)	137 (36.8)	0.30 (0.21 to 0.43)	<0.001
Metropolises	294(87)	44(13)	2.12 (1.38 to 3.26)	0.001

COR, Crude odds ratio; EDHS, Ethiopian Demographic and Health Survey; STI, sexually transmitted infection.

of the correlates to empty model well explained within three models, particularly in the final model. In moderation analysis, only the occupation of respondents was significantly moderated by region (online supplemental files 3–6 tables).

Individual level correlates

The odds of substance use were 59 and 80% higher among ever-married men who were in the age category of 25–34 (AOR 1.59; 95% CI 1.21 to 2.10) and 35–44 (AOR 1.80; 95% CI 1.32 to 2.45) in relation to men within the age category of 15–24 years. The ever-married men who had attended secondary and above education were 36% less likely to use substances than men who had no formal education (AOR 0.64; 95% CI 0.51 to 0.82). The odds of substance use were 34% higher among ever-married men

with 3–5 living children compared with their counterparts (AOR 1.34; 95% CI 1.04 to 1.53). The odds of substance use among employed ever-married men were 36% higher than in unemployed men (AOR 1.36; 95% CI 1.05 to 1.76). The odds of substance use were 76% higher among ever-married men who had a sexual incompatibility with their wives compared with their counterparts (AOR 1.76; 95% CI 1.43 to 2.86). On the other hand, ever-married men who had ever tested for HIV were obtained to have 43% higher odds of substance use than their counterparts (AOR 1.43; 95% CI 1.22 to 1.68). Similarly, the ever-married men who watched TV at least once a week had 50% higher odds of substance use than their counterparts (AOR 1.50; 95% CI 1.25 to 1.81).

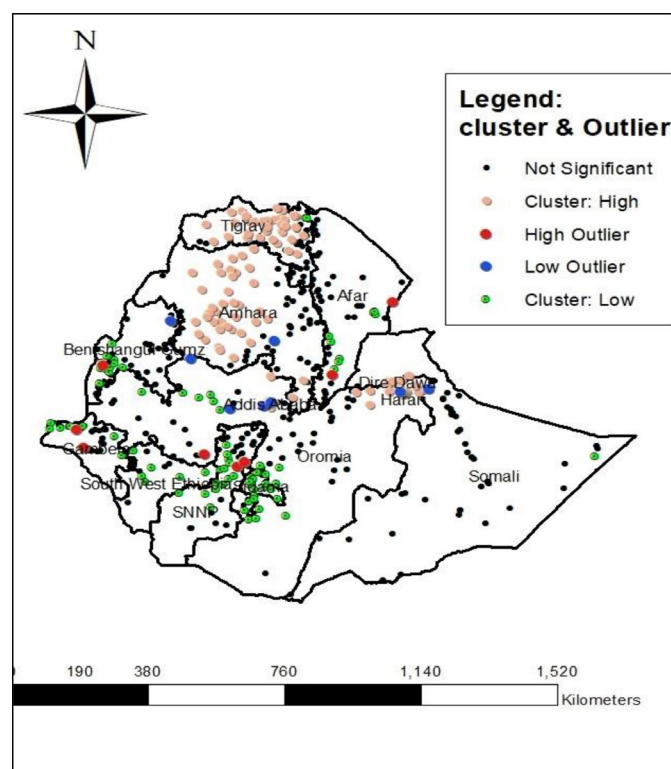


Figure 1 Cluster and outlier analysis (Anselin Local Moran's) of substance use among married men in Ethiopia, EDHS 2016. Source shape file of the map was freely available from <https://africapendata.org/dataset/ethiopia-shapefiles>. EDHS, Ethiopian Demographic and Health Survey.

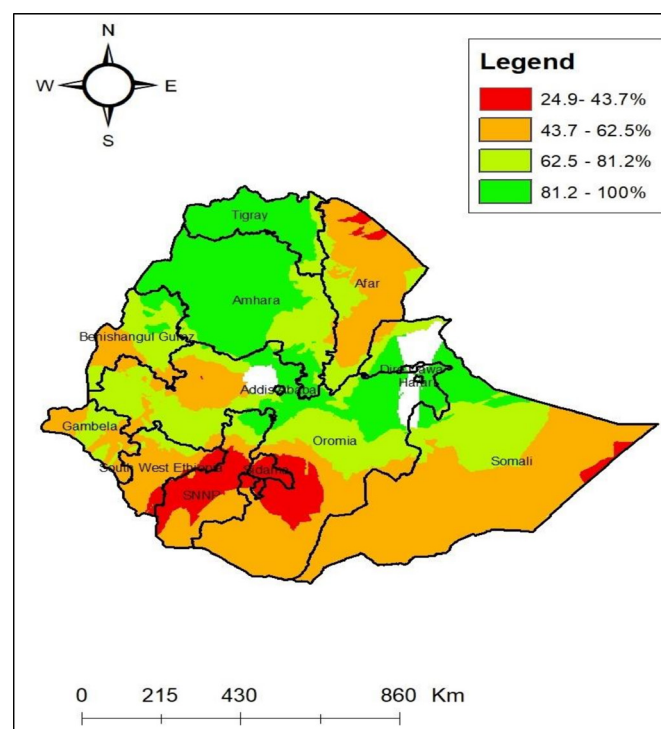


Figure 2 Ordinary interpolation of substance use among married men in Ethiopia, EDHS 2016. Source shape file of the map was freely available from <https://africapendata.org/dataset/ethiopia-shapefiles>. EDHS, Ethiopian Demographic and Health Survey.

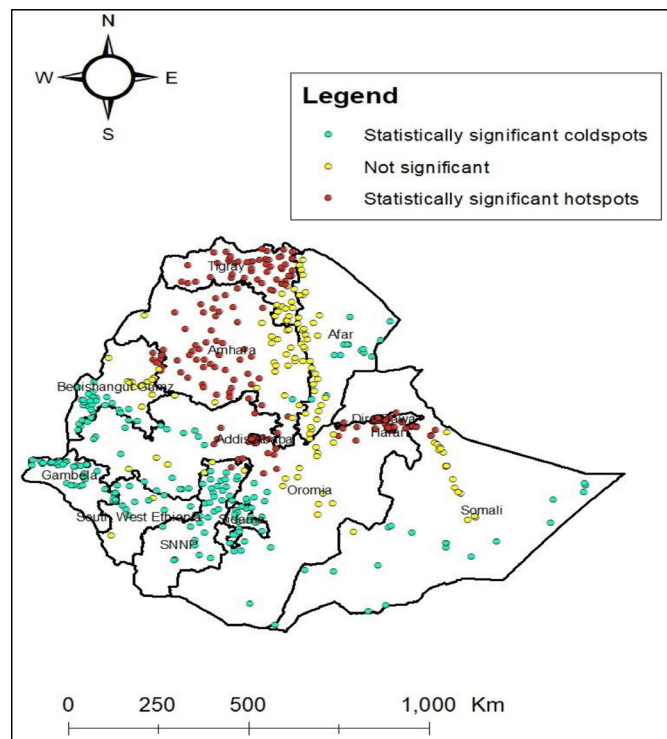


Figure 3 Cold and hotspot analysis of substance use among married men in Ethiopia, EDHS 2016. Source shape file of the map was freely available from <https://africaopendata.org/dataset/ethiopia-shapefiles>. EDHS, Ethiopian Demographic and Health Survey.

Community-level correlates

The odds of substance use among ever-married men living in the metropolises (city) regions were 2.25 times more likely than those living in the agrarian regions (AOR 2.25; 95% CI 1.36 to 3.74). In addition, there were 65% lower odds of substance use among ever-married men living in the pastoralist region compared with those living in the agrarian regions (AOR 0.35; 95% CI 0.24 to 0.51) (tables 2 and 3).

DISCUSSION

This study was done to investigate the prevalence and correlates of substance use among ever-married men in Ethiopia using the 2016 EDHS. In this study, the overall one of the three substance use was 72.5%, with 59.6% using only one substance. This study's finding was slightly higher than those studies conducted in Ethiopia²⁵ and sub-Saharan Africa.⁷ This might be due to the difference in the age of participants, duration of the study and sample size. Around 12.9% of the respondents were two and above substance users, which is lower than a previous study conducted in Ethiopia⁴⁰ and studies conducted in the USA,⁴¹ Scotland⁴² and United Arab Emirates.⁴³ The discrepancy in the prevalence of substance use can be explained by the characteristics of the respondents, socio-economic status, accessibility of the substances and social desirability bias. Cigarettes (7.4%), chat (31.6%) and alcohol (47.8%) were the most often used substances in

ascending order. In terms of chat use, the results were lower than the findings in prior studies conducted in Ethiopia,^{44–46} Yemen⁴⁷ and Uganda.⁴⁸ This wide range of results could be attributable to differences in sample size, study duration and study participant characteristics.

On the other hand, the DHS was conducted among a large population and described as an amalgamation of the country's most remote and urbanised locations. Alcohol was one of the most commonly used substances in this survey. This finding was in line with research conducted in Ethiopia,^{23 49} but it was at odds with findings from Morocco,⁵⁰ Bangladesh⁵¹ and the USA,⁵² where the cigarette was widely used. The variation could be due to the method employed to measure alcohol use and media advertising, as well as socioeconomic differences. In Ethiopia, there is a wide difference in substance use by region. The Amhara and Tigray regions had a greater percentage of substance users (92% vs 95%, respectively), consistent with earlier findings in Ethiopia.^{25 53}

On the other hand, the spatial autocorrelation analysis of at least one of the three substance use across the regions was observed as a clustering pattern (Global Moran's $I=0.403$, $p<0.0001$). This indicates that one of the three substances used in Ethiopia was aggregated in specific areas. Accordingly, the highest hot-spot areas were found in Tigray (central and west), Amhara (central and east), Addis Ababa (central), Harari (west), Dire Dawa (west) and some parts of the northwest Benishangul Gumuz region. Differences in substance usage by geographical region could be attributable to socioeconomic level, culture and accessibility of substances.

Individual and community-level correlates such as current age of ever-married men, attending secondary and higher education, being employed, the number of living children, sexual incompatibility with their wife, ever tested for HIV, frequently watching TV, living in metropolises (city) and pastoralist region was found to have a statically significant correlates based on the multilevel logistic regression analysis. Compared with men between the ages of 15–24, the odds of substance use were higher among ever-married men between the ages of 25–34. This finding was in line with a previous study conducted in Ethiopia.^{25 44 53 54} This could be because the likelihood of substance abuse rises as people live longer and have more life experiences.^{55 56} Second, young individuals may be reliant on their families, which lessen the prearranged condition for using substances, such as the ability to purchase them. Ever-married men with a secondary or higher education had a lower risk of substance use when compared with men who had no formal education. This finding is comparable to a study in Saudi Arabia.⁵⁷ The possible explanation for this finding might be that illiterate men would have a lack of information on the negative consequences of substance use on their health. The probabilities of substance use were higher among employed ever-married males than among jobless men, which is consistent with prior Ethiopian study findings.^{28 44} This may be related to the fact that

Table 3 Multilevel multivariable logistic regression analysis of substance use among ever-married men by individual and community level correlates from 2016 EDHS data (n=7793)

Variables	Model I (null model)	Model II	Model III	Model IV
		Individual-level variables	Community-level variables	Individual and community-level variables
Age of the respondents				
15–24		1		1
25–34		1.63 (1.24, 2.15)**		1.59 (1.21, 2.10)**
35–44		1.89 (1.38, 2.57)**		1.80 (1.32, 2.45)**
≥45		1.84 (1.32, 2.57)**		1.71 (1.22, 2.39)
Educational status				
No formal education		1		1
Primary education		0.99 (0.83, 1.18)		0.98 (0.82, 1.17)
Secondary and above education		0.65 (0.51, 0.83)**		0.64 (0.51, 0.82)**
Religion				
Christian		1		1
Muslim		0.92 (0.74, 1.15)		1.02 (0.82, 1.29)
Others		1.50 (0.80, 2.82)		1.50 (0.80, 2.82)
Occupation				
Employed		1.42 (1.10, 1.84)*		1.36 (1.05, 1.76)*
Not employed		1		1
No of living children				
No children		1.54 (0.78, 2.85)		1.25 (0.90, 1.74)
1–2 children		1.35 (0.57, 2.56)		1.14 (0.86, 1.39)
3–5 children		1.59 (1.34, 2.78)*		1.34 (1.04, 1.53)*
6 and above		1		1
Wife refusing sexual intercourse				
Yes		1.85 (1.49, 2.91)*		1.76 (1.43, 2.86)*
No		1		1
Have any STI				
Yes		0.86 (0.48, 1.54)		0.83 (0.46, 1.47)
No		1		1
Ever tested for HIV				
Yes		1.44 (1.23, 1.70)**		1.43 (1.22, 1.68)**
No		1		1
Frequently watching television				
Not at all		1		1
At least once a week		1.57 (1.31, 1.89)**		1.50 (1.25, 1.81)**
Have a bank account				
Yes		1.15 (0.94, 1.40)		1.12 (0.93, 1.37)
No		1		1
Wealth index				
Poor		1		1
Middle		0.92 (0.73, 1.15)		0.84 (0.68, 1.10)
Rich		1.03 (0.83, 1.28)		0.89 (0.71, 1.11)
Place of residence				
Urban			1	1

Continued

Table 3 Continued

Variables	Model I (null model)	Model II	Model III	Model IV
		Individual-level variables	Community-level variables	Individual and community-level variables
Rural			0.93 (0.62, 1.40)	1.10 (0.70, 1.70)
Region				
Agrarian			1	
Pastoralist			0.30 (0.21, 0.43)**	0.35 (0.24, 0.51)**
Metropolises			2.02 (1.22, 3.35)*	2.25 (1.36, 3.74)*
Measure of variation				
Community level variance (SE)	3.61 (0.084)**	3.31 (0.083)**	1.97 (0.078)**	1.56 (0.079)**
ICC % (95% CI)	52.2 (47.9 to 56.6)	50.1 (45.7 to 54.6)	48.1 (43.6 to 52.5)	47.2 (42.7 to 51.7)
PCV (%)	Reference	41.8	45.4	56.8
MOR	3.44	2.00	1.88	1.49
Model selection				
Log-likelihood	-3501.14	-3440.65	-3459.51	-3416.06
AIC	7006.27	6925.31	6929.03	6878.11
BIC	7020.14	7077.85	6963.70	7037.56

*p<0.05, **p<0.001.

AIC, Akaike's information criterion; BIC, Bayesian information criterion; EDHS, Ethiopian Demographic and Health Survey; ICC, intraclass correlation; MOR, median OR; PCV, proportional change in variance; STI, sexually transmitted infection.

unemployed people cannot afford to buy substances. In the moderation analysis, the occupation was significantly moderated by the community level correlate, which is the region. The extent of association between occupation and substance use was increased due to community-level moderator (region). When compared with their counterparts, the odds of substance use were higher among ever-married men who had a sexual incompatibility with their wives. This could be explained by the fact that when there is a sexual incompatibility between two partners, there is a chance that men will use substances to cope with the stress.

Similarly, ever-married males who watched TV at least once a week had a higher risk of substance use than those who did not watch TV at all. This result was in line with a previous study conducted elsewhere.²⁵ This could be because some substances, such as alcohol, are heavily promoted in the media (TV). Substance use was more common among ever-married men who lived in metropolises (city) regions than those who lived in agrarian regions. Furthermore, ever-married men living in the pastoralist zone had lower odds of substance use than those living in the agrarian regions. This finding was in line with earlier Ethiopian research.^{44 58} Disparities in substance usage by geographical region may be attributable to differences in substance distribution, accessibility, production, marketing and other cultural elements of Ethiopian men.^{59 60}

Despite using a sizeable, nationally representative sample, the study has some limitations related to respondents and secondary data. First, as the study is cross-sectional, it is impossible to conclude a causal relationship between the determinants and the outcome variables. Second, the study did not consider the frequency, dosage, clinical characteristics and effects of addiction to these substances. Third, the outcome variable was established by asking questions that might have influenced the level of substance use rather than validating blood samples. In addition, substance use could be rejected as the substance use response was based on self-reporting. Thus, our study did not look at all substances; instead, it concentrated on alcohol, cigarettes and chat.

CONCLUSION

Despite the aforementioned limitations, nearly three-fourths of ever-married men used one of the three substances. Alcohol was by far the most often used substance. There was a disparity in the prevalence of substance use by geographic region, with Amhara and Tigray having the highest percentages. Individual-level and community-level correlates such as current age, secondary and higher education, employment, number of living children, HIV testing history, sexual incompatibility with their wife, frequent TV watching; living in metropolises(city) and pastoralist regions were found to have a statistically significant relationship with one of the

tree substance use. Given these findings, it is critical to lessen the problem by improving modifiable individual-level variables such as educational status, reducing sexual incompatibility with their wife, and reducing substance advertising through mass media.

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