HIV Voluntary Counseling and Testing Uptake and Associated Factors among Sexually Active Men in Ethiopia: Evidence from the 2016 EDHS Using Multilevel Modeling

Teshome Kabeta Dadi (tka1204@gmail.com)
Jimma University https://orcid.org/0000-0003-0749-8908
Merga Belina Feyasa
Addis Ababa University
Mamo Nigatu Gebre
Jimma University

Research

Keywords: EDHS, Multilevel, sexually active men, Voluntary HIV counseling and testing

DOI: https://doi.org/10.21203/rs.3.rs-31178/v1

Abstract

Background HIV counselling affirms that people exercise their right to known their HIV status and open the gateway to care, treatment, and support for a person in need. Existing evidence shows that its counselling and testing uptake among sexually active males in Ethiopia is too low and hence this study aims to determine the status of uptake and identify its determinants.

Method Data on 12, 688 sexually active men was extracted from the 2016 Ethiopian Demographic and Health Survey. Multilevel logistic regression was fitted to identify the factors associated with the uptake. Result This study depicted that the overall voluntary counseling and testing of HIV uptake among sexually active men in Ethiopia was 45.69%; 95% CI [43.08%, 48.33%].

Results showed that about 13% of the variation in the likelihood of being tested for HIV was due to the variation among the regions. Moreover, age, religion, education, occupational, marital status, HIV knowledge, health insurance, wealth status, risky sexual behavior, discussion about family planning with health workers, owning of mobile, frequency of watching television and listening to the radio were significant factors.

Conclusion Voluntary counseling and testing uptake among sexually active men in Ethiopia is low and varies across the regions. The level of HIV knowledge, having risky sexual behavior, health insurance, and media were some of the significant factors. Therefore, giving due consideration to these factors worth boosting voluntary HIV counseling and testing uptake, which is an integral component of the strategies to efficiently prevent and control the disease.

Background

There is a strong consensus within the global community to end acquired immune deficiency syndrome (AIDS) by 2030 (1). Closing the book on the AIDS epidemic is a momentous opportunity to lay a foundation for a healthier and equitable world for future generations which is impossible without available and accessible human immuno virus (HIV) treatment to all who need it (2). HIV counseling and testing create the gateway to care, treatment, and support for a person in need (3, 4). To affirm that people exercise their right to know their HIV status and benefitted from antiretroviral treatment (ART), HIV testing and counseling must be radically scaled (5).“All forms of HIV testing and counseling should be voluntary and adhere to the five C’s: consent, confidentiality, counseling, correct test results and connections to caring, treatment, and prevention services”(6).

In 2014, the Joint United Nations Program on HIV/AIDS (UNAIDS) and other partners launched the 90–90–90 targets with three-pronged strategy; diagnosing 90% of all HIV-positive persons, providing ART for 90% of those diagnosed, and achieving viral suppression for 90% of those treated by 2020 (2). However, the 2019 UNAIDS global HIV statistics report on world AIDS day showed that 37.9 million people were living with HIV and 1.7 million were newly infected while 770,000 people died from it at the end of 2018 (7). Many people with HIV also remain unaware of their HIV status and start HIV treatment after their

immunity is already depleted resulting in poor prognosis and transmission of the disease to vulnerable individuals due to late HIV counseling and testing (3). According to the 2015 World Health Organization (WHO) estimate, only 54% of people living with HIV know their HIV status (8). HIV counseling and testing uptake in Africa ranges from 10% in Burkina Faso (9) to 69.9% in Malawi (10). In Ethiopia, the uptake of HIV counseling and testing is relatively low (4). A time-series study done in Ethiopia by Girum et al. concluded that Ethiopia will not achieve the first 90% target without which the control of the epidemic will not be achieved (11). The 2016 Ethiopia Demographic and Health Survey (EDHS) report also showed that 20% of women and 19% of men had been tested for HIV and received the most recent test results (12).

There are also gender disparities in voluntary HIV counseling and testing uptake. The WHO (2015) report showed that less than one-third of adult males receive HIV testing services while more than two-thirds of adult females receive the service (8). Different studies were done in Sub-Saharan Africa (SSA) also showed that voluntary HIV counseling and testing are relatively low among males than females (13, 14).

Different studies also show that age, gender, the region of residence, marital status, being covered by health insurance, age at first sex, stigma towards HIV patient, comprehensive HIV knowledge, discussion about HIV with a partner, HIV risky behavior, wealth index, educational status, religion and distance from the nearest health facility were significantly associated with voluntary HIV counseling and testing uptake (9, 10, 13–17).

Although voluntary HIV counseling and testing uptake are alarmingly low among males residing in Ethiopia, there is a dearth of information on factors contributing to it. Therefore, the current study is aimed to identify the independent predictors of voluntary HIV counseling and testing among sexually active males in Ethiopia using the nationally representative 2016 EDHS.

Methods

Data sources

The 2016 EDHS, the fourth Demographic and Health Survey (DHS), data was collected by the Central Statistical Agency (CSA) of Ethiopia and other stakeholders; processed and organized by ICF International into different datasets. The authors accessed these public domain datasets from the MEASUREDHS website by permission. Variables related to the VCT of HIV were extracted and processed for secondary analysis. Standard protocols and three types of tools were used for collecting DHS data, namely the Household Questionnaire, the Woman's Questionnaire, and Man's Questionnaire. Further standardization and contextualization of the questionnaires were also done by governmental and non-governmental shareholders to maintain the validity of the tools.

Study population and sampling procedures

Ethiopia has been administratively divided into 9 regions and two towns administrates. Regions are divided into Zones, and Zones into administrative units known as Weredas. Each Wereda is further

subdivided into the lowest administrative units, called Kebele. During the 2007 census, each kebele was subdivided into census enumeration areas (EAs), which were convenient for the implementation of the census and subsequent surveys (12). The 2016 EDHS followed a two-stage sampling design with stratification into urban and rural. At the first stage of the sampling, 645 EAs, 202 from urban and 443 from rural were selected based on the 2007 Ethiopian population and housing census sampling frame called EA. For Man's questionnaire, males aged from 15-59 in the selected EAs of the selected households were eligible. The second stage of the sampling involved selection from the complete listing of households in each selected EAs by a probability proportionate to the size (PPS) of each cluster. Approximately, 28 households from each cluster (giving a total of 18,008 households), of which 17,067 households were occupied and 12,688 eligible males were identified and interviewed (12).

Measurements

The outcome variable along with all other socio-demographic variables (region, sex, age, religion, wealth status, marital status, occupational status, place of residence, sex of household head, and education level), discussion about family planning with a health worker, coverage status of health insurance, owning of a mobile telephone, use of the internet, frequency of using the internet within a month, frequency of reading newspaper or magazine in a month, frequency of listening to the radio in a month, frequency of watching television, relationship with a most recent sex partner, decisions on personal health care, decisions on large household purchases and decisions on how to spend respondent's earnings, and respondent's involvement during check-ups for the most recent child were measured by respective direct questions asked from the respondents. The three other explanatory variables, namely risky sexual behavior, stigma status, and knowledge of HIV were indirectly measured by asking different indicator questions for each of the three variables and scoring and grouping were done to measure the generic variables.

Operational definitions

The respondents were considered to have risky sexual behavior if the response was yes to either of the following six questions (having multiple sex partner in a lifetime, having multiple sex partner in last 12 months excluding the spouse, condom using status the last time had sex with a most recent partner in last 12 months, condom using status every time had sex with a most recent partner in last 12 months, consistent condom use for paid sex in last 12 months, condom using status every time had sex with 2nd to most recent partner in last 12 months, and condom using status every time had sex with 3rd to most recent partner in last 12 months). On the other hand, levels of stigma and HIV knowledge were developed by composite questions to measure each appropriately. Stigma score from 7 questions was calculated and then groupings of the scores were performed. The variables from which scoring was done were whether the respondents ashamed if someone in the family had HIV, buy vegetables from a vendor with HIV positive, whether attending school together with children living with HIV is right or not, hesitation to take HIV test, afraid bad label about people with or believed to have HIV, afraid of a loss of respect from other people if positive for HIV and afraid to get HIV from contact with saliva from an infected person.

The scores calculated from these questions range from 0 to 7 and were grouped into four classes. Consequently, score 0 shows no stigma, score from 1-3 shows low stigma, score 4 was considered to be a moderate stigma, and a score of 5-7 as high stigma. By a similar method, 'knowledge about HIV' was constructed by combining the responses to 9 sets of questions. Scores were computed from the question that asks whether the respondents ever heard about HIV/AIDS, whether the respondent knows about reducing the risk of getting HIV by always using condoms during sex, whether the respondent knows about reducing the risk of getting HIV by having 1 sex partner only, who has no other partners, whether the respondents answered right answer on transmissions of HIV via mosquito bites and by sharing food with a person who has AIDS, whether the respondents know that a healthy-looking person can have HIV, whether the respondents know that HIV can be transmitted during pregnancy, delivery, and breastfeeding. These 9 questions were added together and the minimum sum was 1 and with a maximum of 9. After scoring, the grouping of scores was performed to form the 'HIV knowledge' levels of the respondents. The average score was 7, and scores strictly less than average were categorized to have low 'knowledge on HIV' and the respondents with scores 7 and 8 were categorized to have high knowledge on HIV while respondents with score 9 were grouped as those having comprehensive knowledge of VCT HIV.

Other definitions, specific to this paper, were also given. Respondents in the age groups of 15-29 were considered as youths, those in the age group of 30 to 44 are adults and 45 to 59 were considered as late adults.

Agricultural workers: refers to those males who were market-oriented skilled agricultural workers, market-oriented skilled forestry, fishery and hunting, and agricultural, forestry, and fishery laborers.

Professional workers: include chief executives, senior officials, and legislators, administrative and commercial managers, production and specialized services managers, science and engineering professionals, health professionals, teaching professionals, business and administration professionals, information and communications technology professionals, legal, social and cultural professionals, science and engineering associate professionals, health associate professionals, business and administration associate professionals, legal, social, cultural and related associate professionals, information and communications technicians, teaching associate professionals and special education teaching associate professionals.

Trade or sales workers: encloses sales workers, building and related trades workers, excluding electricians, metal, machinery and related traders, handicraft and printing workers and, electrical and electronic traders.

Elementary occupation: covers cleaners and helpers, laborers in mining, construction, manufacturing and transport, food preparation assistants, street and related sales and service workers and, refuse workers and other elementary workers.

Others workers: consists of hospitality, retail, and other services managers, general and keyboard clerks, numerical and material recording clerks, other clerical support workers, personal service workers, personal

care workers, protective services workers, handicraft and printing workers, food processing, woodworking, garment, and other craft and related trades workers.

Data analysis

Extraction of relevant variables, data exploration, cleaning, coding, and recoding, generating new important variables, descriptive and inferential statistics were obtained using Stata 14.2 statistical software. The multilevel logistic regression model was fitted to assess regional variation of HIV-VCT uptake and to identify its determinants. The DHS surveys often follow a hierarchical data structure as the surveys are based on multistage stratified cluster sampling (12). The appropriate approach to analyzing such survey data is, therefore, based on nested sources of variability which come from different levels of the hierarchy. Often, two responses from the same group tend to be more like one another than two observations from different groups and this association is called within-cluster correlation. Effects arising from the specification of correlation among responses from the same clusters are commonly known as Random Effects. Models used for the analysis of this type of data must account for associations among observations within clusters (levels) to make efficient and valid inferences. When the variance of the residual errors is correlated between individual observations as a result of these nested structures, ordinary logistic regression is inappropriate. The abovementioned background is a basis for using multilevel logistic regression in this analysis.

In regression analysis, not only the effect of a given explanatory variable is of interest but also the variation of this effect in the population might be invaluable. Oftentimes, this variation is captured via interactions. In classical regression, estimates of varying effects can be noisy, especially when there are few observations per group; multilevel modeling allows us to estimate these interactions to the extent supported by the data. Multilevel models also allow us to study effects that vary by group. In the analysis of multilevel regression, the clustering effect plays a great role in the estimation of the parameters and this clustering effect can be quantified by intraclass correlation (ICC). ICC is the proportion of total variation in the response variable that is accounted for by between-group variation. The ICC can also be thought of as the correlation among units within the same group, i.e the degree of homogeneity of the outcome within the group (18). In the current study all predictors are at level 1 and the clustering variable is a region where the subjects were residing.

All the outputs for descriptive analysis were done using weights provided in EDHS 2016 data as per the recommendations by the DHS program. The ways weights are used to vary based on the purpose of the analysis. To carry out multilevel analysis, the weights from DHS are adjusted as per the recommendation by Adam (19). Subsequently, we have checked the goodness of fit after weighting the dataset by both candidate weights. As expected, the multilevel logistic regression fitted by using the adjusted weights resulted in lower AIC = 9, 162.102, and BIC = 9, 233.47 as compared to the results from unadjusted weights with AIC=10, 492.85 and BIC=10, 564.22. In addition to the choice of weights, the principle of parsimony dictates us to go for the model with few numbers of variables in the model. Consequently,

significant variables retained in our final model which has smaller AIC and BIC, and the results are presented in Table 3.

Ethical consideration

The EDHS 2016 survey protocol, including biomarker collection, was reviewed and approved by the Federal Democratic Republic of Ethiopia Ministry of Science and Technology and the Institutional Review Board of ICF International. Additionally, written consent was obtained from each respondent. For analysis, the investigators received permission from the public domain MEASUREDHS website and reanalyzed the dataset on male respondents.

Results

Characteristics of the participants

Twelve thousand six hundred eighty-eight male respondents were included in the analysis of this 2016 EDHS national survey and the mean age (±SD) of the respondents was 30.92 (±0.16) year. About 50.69% of the participants were youths aged from 15 to 29 years. The majority (55.54%) of the participants were married and nearly half of them were in the rich economic status. The dominancy of males was sightseen by this study, 87.66% of them were from male-headed households. Agriculture is the leading type of occupation constituting 66.34% of all types of work captured in the survey. The majority (80.29%) of the respondents were rural dwellers (Table 1).

Behavioral and Individual Characteristics of Ethiopian males, EDHS 2016

Concerning the three indicators, namely about risky sexual behaviors, feeling of stigma about PLWHIV, and knowledge about HIV/AIDS, 40.84% of the participants were showing risky sexual behavior, about 78.4% had a high feeling of stigma on PLWHIV and only 3.83% had comprehensive knowledge about HIV. Whereas, about one third (29.41%) of the interviewed males had low knowledge about HIV. From the total respondents, only one-fourth of them discussed FP with health workers in the last few months before the interview. Regarding health insurance, only 6.53% were covered with health insurance from the total participants. Of all participants, 69.41% and 77.03% of participants were from households where respondents and their wives or their partners were jointly deciding on respondents' health care and large households' purchase respectively (Table 2).

HIV VCT Uptake among sexually active men in Ethiopia, EDHS 2016

The current study revealed that HIV VCT uptake among sexually active men in Ethiopia from the 2016 EDHS was 45.69%; 95% CI [43.08%, 48.33%]. The narrow confidence interval with the range of 5.25 implies that the study yielded quite a precise estimate of HIV VCT uptake among sexually active men in Ethiopia that should have been reported but missed from the 2016 EDHS report. The 2016 EDHS summary report only included descriptive figures for those who were tested and received their results. The distribution of HIV VCT uptake across regions is presented in Figure 1.

Result of multilevel logistic regression

The result of ICC with its SD (0.13173±0.06041) shows that about 13% of the variation in the likelihood of being tested for HIV/AIDS was explained by the variation among the regions in Ethiopia. As we can see from a 95% CI [0.05113, 0.29931], the variation among the regions is statistically significant, and hence any estimation without considering this effect will result in a biased estimate.

From the socio-demographic factors: age, religion, educational level, occupational status, marital status, and sex of household heads were significantly associated with VCT uptake. Level of knowledge about HIV, wealth status, presence of risky sexual behavior, discussion about FP with HW, coverage status by health insurance, owning of mobile, frequency of watching TV, and listening to the radio were the other non-socio-demographic factors significantly associated with VCT for HIV uptake.

Being in the late adult age group (45-59) was significantly associated with decreased HIV VCT uptake as compared to the youths aged 15 to 29 (AOR=0.69406;95% CI [0.59011, 0.81634]). The odds of being tested for HIV among Protestant (AOR=0.79434; 95% CI [0.64669, 0.97571]) is lower by about 30% compared to those who were following Orthodox religion. Attending primary, secondary and higher education (AOR=1.29468; 95% CI [1.04475, 1.60439]), (AOR=2.72233; 95% CI [1.98135, 3.74042]) and (AOR=2.86842; 95% CI [1.87277, 4.39341]) respectively were also significantly associated with the uptake compared with those who never attended school. Married and males who were in the other form of the union were more likely to be tested than those who were never married with (AOR= 2.57830; 95% CI [1.99872, 3.32595]) and (AOR=2.35340; 95% CI [1.90368, 2.90937]) respectively. Respondents engaged in Professional work, (AOR=1.98924; 95% CI [1.31471, 3.00986]) trading or sales (AOR=1.73206; 95% CI [1.26195, 2.3773]), elementary occupation (AOR=1.46256; 95% CI [1.02507, 2.08676]) and other occupation (AOR=1.83561; 95% CI [1.33627, 2.52153]) were significantly associated with outcome variable compared to the not working counterpart. Sex of the household head was also a significant predictor from the socio-demographic variables with (AOR=0.82377; 95 % CI [0.68918, 0.98465]) compared to males from male-headed households.

From the other non-socio-demographic variables: having high knowledge about HIV compared to having low knowledge (AOR=1.169523; 95 % CI [1.02009, 1.34085]), the rich compared to the poor (AOR=1.58591; 95% CI [1.37055, 1.83510]), experiencing risky sexual behavior compared to the non-experiencing (AOR=1.861432; 95% CI [1.51341, 2.28949]), having a discussion with HW about family planning concerning the not having (AOR= 1.54497; 95% CI [1.28109, 1.86322]). Being covered by health insurance (AOR= 1.30135 95% CI [1.09512, 1.54642]), owning of a mobile telephone (AOR=1.90564; 95% CI [1.63622, 2.21943]), listening of radio at least once a week compared to those who don’t listen at all (AOR=1.23201; 95% CI [1.06910, 1.41975]), and watching television at least once a week (AOR=1.29040; 95% CI [1.02128, 1.63044]) in respect of those who don’t watch at all were the significant variables associated with HIV VCT uptake.

Discussion

HIV VCT uptake among sexually active men in Ethiopia was estimated to be 45.69% (95% CI: [43.08%, 48.33%]). The magnitude of our study is greater than many findings done in Burkina Faso, Ethiopia, Cambodia, and South Africa (9,15,20–23). But the current figure is less than the result drawn from the study done in Malawi (10). Most of the studies reviewed clarified that the majorities of the figures were less than that of the result obtained by the current study and this may have linkage with the duration when the studies were conducted meaning that they were mostly done before the year of this study since in the most recent times the VCT for HIV uptake is expected to increase. On the other hand, the uptake of HIV VCT among males was less than that of the females by this study (24) though the result obtained for females' HIV VCT uptake might not be reliable since they didn't report whether they applied weighting before doing the analysis which should be done for DHS data.

In this study, while identifying the factors associated with the uptake of VCT the authors were also interested to see the effect of regional variability on the prevalence of the uptake. To account for this effect, ICC among regions was computed and it was found to be about 13%, which is a very good reason to consider fitting the multilevel logistic regression model instead of the ordinary binary logistic regression. An ICC of at least 2% is suggestive of a potential higher-level effect and worth considering of a multilevel setup (25).

This study uncovered that there is reasonable evidence on knowledge of HIV/AIDS. Compared to those who have low knowledge about HIV/AIDS, males who have high knowledge of HIV/AIDS are more likely to get tested for HIV/AIDS. In fact, regarding males who have high knowledge of HIV/AIDS, the odds of being tested for HIV/AIDS is 17% more than those with no knowledge of HIV/AIDS. This finding is consistent with the results of other studies (16,24,26,27). This could be since men who do have comprehensive HIV knowledge may also have better insight on the potential risks associated with the disease, and, need to be tested to know their HIV seron status to prevent themselves from the disease and to prevent the disease's future sequels.

The odds of accepting HIV VCT for late adult men within the age group of 45-59 were lower by about 30.6% than the youths aged 15-29. This finding is in line with the study done in Burkina Faso which reported males in the young age group were more likely to be tested for HIV (9). The findings from the current study formed evidence that differences in knowledge about HIV across different age groups are the most likely reason for this to happen since among the males who have comprehensive and high knowledge, 55% and 52% were youths respectively. However, this result is different from the study done in Arusha, Tanzania that discovered the VCT uptake was found to be 3 times higher among those aged 18 years and above as compared to those below 18 years (15,30). The possibility of the difference can be related to the way age grouping was done in the current study is more specific to contain those similar populations together than the one done in the Tanzania study.

Regarding wealth status, the odds of getting tested for HIV/AIDS for the rich males were 58.6% higher than the poor. Different studies (14–16,20,28) also showed that rich people are more likely to accept HIV VCT as compared to poor people. This could be explained by different reasons. Rich people might have

more access to media and have a better awareness of HIV than the poor. Similarly, rich men may have better access to health facilities than poor men.

According to these findings, people who exhibit risky sexual behavior are more likely to get tested for HIV/AIDS. Moreover, the odds of getting tested for HIV/AIDS, for males who exhibit risky sexual behavior, is 86.1% more than males who were not exercising risky sexual behavior. This is concordant with the findings from Cambodia (15), rural Ethiopia (16), and rural Tanzania (17), where men with high-risk sexual behavior were more likely to accept HIV VCT as compared to those without risky sexual behavior. This could be due to the reason that men who have risky sexual behavior are more apprehensive about their HIV test results than men without risky sexual behavior and are more curious to know their HIV status.

Religion was among the socio-demographic variables significantly associated with HIV VCT uptake. Men, protestant Christians were less likely to accept HIV VCT as compared to Orthodox Christians. The secondary data analysis of DHS in Zimbabwe also showed that religion was associated with HIV VCT uptake (29). Another study done in Ethiopian and South Africa showed that the odds of opting for HIV VCT of male Muslims were by 40% and 30% lower compared to Christian, respectively (27,30). But two different studies done in Tanzania showed that Muslims were more likely to opt-in HIV VCT than Christians (17,31). The discrepancy could be due to the differences in dogmas of churches and mosques at different geographical locations and cultures.

It is undeniable that education plays a great role in gaining knowledge and it has an unprecedented contribution in the intension to accept VCT for HIV and the results in the current study also confirm this idea. For males who attended primary school, the odds of getting tested for HIV/AIDS were higher than those with no education by more than 29.5%; whereas for both of those who attended secondary and higher institutions, the odd increases nearly by three-fold. The secondary data analysis from Zimbabwe showed that the odds of up taking HIV VCT increases educational level increases (29). Many different studies (10,15,16,32) also showed that people with higher educational levels were more likely to receive HIV VCT than those with lower educational status. Educated people might have a better knowledge of HIV than those who are not educated and may better accept HIV VCT than their counterparts. On the other hand, people with higher educational status might not have a feeling of stigma towards PLWHIV and better accept HIV VCT. In contrary to this, the study done in South Africa showed that higher educational status was inversely associated with HIV VCT (30). The discrepancy might be described by differences in integration and mainstreaming of HIV related education in academic curricula.

According to the result of this study, marital status is found to have a statistically significant association with the VCT for HIV uptake. Compared to those who have never been in a union, the odds of up taking HIV/AIDS VCT for married and other males were higher by more than two folds for both categories of the married status. This finding is concordant with the results of secondary DHS data analyses from Cambodia and Malawi where married men were more likely opted in HIV VCT uptake as compared to those who were unmarried (10,15). Other studies were done in rural Tanzania and South Africa also

showed that married men were more likely to opt-in HIV VCT as compared to their unmarried counterparts (17,30). This may be due to the feeling of family responsibility among married men than those who are unmarried. The other possible explanation for this could be an inter-spousal discussion about HIV to safeguard their marriage and the health of their future children.

The occupational status of the male subjects was also found to be a statistically significant factor associated with the VCT for HIV uptake. Compared to males who were not working and didn't work in last 12 months before the interview, the odds of getting tested for HIV/AIDS for professional workers surpasses by about two-fold; whereas the odds for the males engaged in trade/sales, elementary and other types of work are on the upper hand by about 73.2%, 46.3%, and 83.6% respectively. The current finding is consistent with the results elicited by studies conducted in Burkina Faso and Soweto, South Africa (21,22). This is reasonably due to exposure to different workplaces than agriculture is expected to give a different level of access to information about VCT services and benefits.

Sex of household head also matters when it comes to the likelihood of getting tested for HIV/AIDS. The odds of getting tested for HIV/AIDS for males, residing in the household where females are the head, is lower by about 17.6% compared to males residing in male-headed households.

Nowadays, the government of Ethiopia is trying to implement health insurance in the country through its coverage is at its infant stage. This study identified that health insurance coverage status for Ethiopian males was found statistically significant in that males covered by health insurance were more likely to be tested than those who were not covered. This result is in line with the recent finding on DHS from Malawi (10). The result seems to be reasonable as people with health insurance covered are very likely to visit health facilities to get health services because they don’t worry about the cost of the services as the insurance is expected to cover.

Contact with the health workers, specifically discussion about family planning with health workers was significantly associated with the chance of getting tested for HIV/AIDS. Besides, the odds of getting tested for HIV/AIDS for males, who had a chance to discuss family planning with the health workers is higher by about 55%. This result supports the existing finding pointed out by the study conducted in rural Ethiopia (16). Contacting HWs and discussing family planning usually paves a way to discuss HIV/AIDS VCT and that perhaps made a difference in the up-taking of VCT.

It’s not uncommon to see the effect of access to media on the likelihood of getting tested for HIV/AIDS and the current result reaffirms the same. More specifically, the effect of access to the mobile telephone is found to be statistically significant. For mobile telephone users, the odds of getting tested for HIV/AIDS was higher by 91% compared to non-users. Moreover, the odds of getting tested for HIV/AIDS for males who were listening to the radio at least once a week, compared to non-listeners, is higher by about 23.2%. Whereas, the odds of getting tested for HIV/AIDS for males who watch TV at least once a week surpasses that of males who do not watch TV at all by about 29%. This result is similar to the findings from Zimbabwe and Burkina Faso where exposure to media was positively associated with HIV VCT uptake (21,29). Evidence from the analysis of the 2016 Uganda DHS showed that listening to radio once a week

and watching television more than once a week increases the odds of being tested for HIV by 4.57% and 8.57% respectively (33). Another study in SSA using three rounds of DHSs also presented that there is a significant relationship between exposure to mass media and HIV VCT uptake (34). The same study also suggested that continuous and proactive media movements may lead to diffusion of ideas that may ultimately promote HIV testing. Evidence from the analysis of the 2016 Uganda DHS and result from a longitudinal analysis conducted in India also showed that exposure to mass media was significantly associated with HIV related knowledge (33,35), and, from the current study, it is evident that HIV related knowledge is strongly associated with HIV VCT uptake.

Strength of the study

The sampling methods used to reach the study participants, methods of data collection, the interviewing techniques applied, its data processing, management, and organization is to the standard and the quality of DHS data is unquestionably the most reliable kind of data. The number of study participants was also sufficiently large and selected from every corner of the country to ensure national representation of the Ethiopian population. The authors have used both descriptive and inferential analyses by weighting the data before doing analyses of any kind to reduce the anticipated bias due to clustering. Moreover, multilevel modeling was also applied to account for the variation of VCT uptake across the regions in Ethiopia.

Limitation of the study

Since the study used data from a single time survey, the temporality between HIV VCT uptake and the aforementioned factors cannot be ascertained and the shreds of evidence should be utilized with care. Besides, because of the lack of qualitative data on EDHS, the authors were unable to investigate the association between some qualitative variables like socio-cultural factors and HIV VCT uptake. On the other hand, some pertinent variables like distance from the nearest health facility which were significantly associated with HIV VCT uptake from other literature and could affect the current study are missing from the EDHS.

Conclusions

HIV VCT among sexually active men in Ethiopia is still unacceptably too low although it is higher than the uptake in some African countries. The study also revealed that there are significant disparities in the uptake of HIV VCT among sexually active men residing in a different region of Ethiopia with the lowest uptake of 14.45% in the Somali region and the highest uptake of 73.30% in Addis Ababa. The study identified that age, religion, educational level, occupational status, marital status and sex of household heads, level of knowledge about HIV, wealth status, presence of risky sexual behavior, discussion about FP with HW, coverage status by health insurance, owning of mobile, frequency of watching TV and listening to the radio were associated with uptake of HIV VCT among sexually active men in Ethiopia. The Democratic Republic of Ethiopia has committed to ending AIDS as a public health threat by 2030. But achieving this goal without scaling up the current HIV VCT among sexually active men in the country

is super ridiculous and toiling in vain. Therefore, any stakeholder working on HIV/AIDS prevention and control should consider the aforementioned predictors of HIV VCT uptake for better success. Future researchers interested in the area should also address qualitative variables like socio-cultural factors which might have a tremendous effect on HIV VCT uptake among sexually active men in the country.

Tables

Table 1: Socio-demographic characteristics of sexually active Ethiopian males, EDHS 2016

Variables	Categories	Total (%)	Ever been tested for HIV			
			Yes		No	
			N	%	N	%
Age of the respondent	Youth	6432 (50.69%)	2544	39.56%	3888	60.44%
	Adult	4226 (33.31%)	2269	53.68%	1958	46.32%
	Late Adult	2030 (16.00%)	984	48.49%	1046	51.51%
Religion	Orthodox	5,690 (44.84%)	3126	54.94%	2225	45.06%
	Protestant	2,748 (21.66%)	1202	43.75%	1129	56.25%
	Muslim	3,985 (31.41%)	1369	34.36%	3081	65.64%
	Other	265 (2.09%)	99	37.50%	143	62.50%
Wealth Status	Poor	4,327(34.10 %)	1395	32.23%	2933	67.77%
	Middle	2443(19.25 %)	948	38.82%	1495	61.18%
	Rich	5918(46.64 %)	3454	58.37%	2464	41.63%
Marital Status	Never in union	4,894 (38.58%)	1678	34.29%	3216	65.71%
	Married	7,047 55.54%)	3760	53.35%	3287	46.65%
	Other	746 (5.88%)	359	48.09%	387	51.91%
Sex of household head	Male	11,122(87.6 6%)	5146	46.27%	5976	53.73%
	Female	1,566 (12.34%)	651	41.56%	915	58.43%
Occupational Status	Not working didn't work/year	951(7.49%)	266	27.93%	685	72.07%
	Agricultural Workers	8418(66.34 %)	3378	40.13%	5040	59.87%
	Professionals	824(6.5%)	668	80.98%	157	19.02%
	Trade/Sales	1153(9.09%)	735	63.77%	418	36.23%
	Elementary work	929(7.33%)	446	48.04%	483	51.96%
	Others	413 (5.09%)	304	73.68%	109	26.32%
	Tigray	795 (6.27%)	467	58.76%	328	41.24%
	Afar	90 (0.71%)	45	50.00%	45	50.00%
	Amhara	3230	1772	54.87%	1458	45.13%

		(25.46%)				
Region	Oromia	4758 (37.50%)	1710	35.93%	3048	64.07%
	Somali	329(2.59%)	48	14.45%	281	85.55%
	Benishangul	128(1.00%)	62	48.99%	65	51.01%
	SNNPR	2596 (20.47%)	1158	44.6%	1438	55.40%
	Gambella	37 (0.29%)	23	63.20%	14	36.80%
	Harari	32 (0.25%)	11	35.42%	21	64.58%
	Addis Ababa	621 (4.90%)	455	73.30%	166	26.70%
	Dire Dawa	73 (0.57%)	45	62.21%	28	37.79%
Residence	Urban	2501 (19.71%)	1695	67.79%	805	32.21%
	Rural	10187 (80.29%)	4102	40.26%	6086	59.74%
Educational level	No education	3840(30.26%)	1424	37.08%	2416	62.92%
	Primary	5901(46.51%)	2328	39.46%	3573	60.54%
	Secondary	1846(14.55%)	1173	63.51%	674	36.49%
	Higher	1101(8.67%)	872	79.26%	228	20.74%

Table 2: Behavioral and individual characteristics of sexually active Ethiopian males, 2016 EDHS

Variables	Categories	Total (%)	Ever been tested for HIV			
			Yes		No	
			N	%	N	%
Risky Sexual Behavior	No	7,506 (59.16%)	2738	36.48%	4768	63.52%
	Yes	5,182 (40.84%)	3059	59.02%	2124	40.98%
Stigma Status	No	503 (4.7%)	311	61.9%	192	38.1%
	High	8,354 (78.4%)	4109	49.2%	4245	50.8%
	Moderate	1,801 (16.9%)	883	49.1%	917	50.9%
Knowledge of HIV	Low	2749 (29.41%)	1317	47.91%	1432	52.09%
	High	6240 (66.76%)	3205	51.36%	3035	48.64%
	Comprehensive	358 (3.83%)	175	49.02%	182	50.98%
Discussion about FP with HWs in a month	No	8429 (66.43%)	3427	40.66%	5338	59.34%
	Yes	4259 (33.57%)	2370	55.64%	1240	44.36%
Covered by health insurance	No	11,859(93.47%)	5297	44.67%	6562	55.33%
	Yes	829 (6.53%)	500	60.32%	329	39.68%
Presence of the respondent check-ups	Not present	1161(41.93%)	560	48.18%	602	51.82%
	Present	1609 (58.07%)	1004	62.40%	605	37.60%
A person who should have a greater say: respondent's health care	Respondent alone	2051(27.45%)	1100	53.64%	951	46.36%
	Respondent and wife/partner	5185(69.41%)	2708	52.23%	2477	47.77%
	Wife/partner alone	213(2.85%)	95	44.75%	118	55.25%
	Someone else	18(0.24%)	8	47.39%	10	52.61%
	Other	4(0.05%)	3	69.38%	1	30.62%
Person who	Respondent alone	1341 17.96%)	647	48.27%	694	51.73%

usually decides large on household purchases	Respondent and wife/partner	5755 (77.03%)	3064	53.24%	2198	46.76%
	Wife/partner alone	336(4.50%)	179	53.33%	330	46.67%
	Someone else	34 (0.46%)	20	57.02%	15	42.98%
	Other	4(0.06%)	4	100.0%	0	0.0%
A person who usually decides how to spend the respondent's earnings	Respondent alone	369(15.59%)	229	62.08%	140	37.92%
	Respondent and wife/partner	1923(81.17%)	1167	64.8%	757	39.35%
	Wife/partner alone	77(3.24%)	55	71.49%	22	28.51%
Relationship with the most recent sex partner	Spouse	6,864(84.72%)	3728	54.31%	3136	45.69%
	Girlfriend/fiancé	610 (7.53%)	413	67.70%	197	32.30%
	Casual acquaintance	130(1.61%)	88	67.59%	42	32.41%
	Commercial sex worker	14(0.18%)	9	65.43%	5	34.57%
	Live-in partner	478(5.90%)	146	30.61%	332	69.39%
	Other	5(0.07%)	2	48.46%	3	51.54%

Table 3: Results from multilevel logistic regression on sexually active Ethiopian males, 2016 EDHS

VCT uptake	Odds Ratio	Robust Std. Err.	Z	P>z	[95% Conf.	Interval]
Knowledge of HIV						
High	1.16952	0.08158	2.250	0.0250	1.0201	1.34085
Comprehensive	1.09342	0.15278	0.640	0.5230	0.8315	1.43788
Age						
Adult	0.98347	0.07919	-0.210	0.8360	0.8399	1.15160
Late Adult	0.69406	0.05746	-4.410	0.0000	0.5901	0.81634
Wealth Status						
Middle	1.10203	0.10859	0.990	0.3240	0.9085	1.33679
Rich	1.58591	0.11809	6.190	0.0000	1.3706	1.83510
Risky Sexual Behavior						
Yes	1.86143	0.19658	5.880	0.0000	1.5134	2.28949
Religion						
Protestant	0.79434	0.08335	-2.190	0.0280	0.6467	0.97571
Muslim	0.79616	0.10701	-1.700	0.0900	0.6118	1.03612
Other	0.78512	0.13286	-1.430	0.1530	0.5635	1.09391
Educational level						
Primary	1.29468	0.14168	2.360	0.0180	1.0448	1.60439
Secondary	2.72233	0.44129	6.180	0.0000	1.9814	3.74042
Higher	2.86842	0.62396	4.840	0.0000	1.8728	4.39341
Marital Status						
Married	2.57830	0.33496	7.290	0.0000	1.9987	3.32595
Other	2.35340	0.25465	7.910	0.0000	1.9037	2.90937
Occupational Status						
Agricultural Workers	1.33470	0.24143	1.600	0.1100	0.9363	1.90264
Professional Workers	1.98924	0.42033	3.250	0.0010	1.3147	3.00986
Trade/Sales	1.73206	0.27984	3.400	0.0010	1.2619	2.37732
Elementary occupation	1.46256	0.26522	2.100	0.0360	1.0251	2.08676
Others	1.83561	0.29735	3.750	0.0000	1.3363	2.52153
Sex of HH head						
Female	0.82377	0.07498	-2.130	0.0330	0.6892	0.98465
Discussion with HW						
Yes	1.54497	0.14764	4.550	0.0000	1.2811	1.86322
Covered by insurance						
Yes	1.30135	0.11456	2.990	0.0030	1.0951	1.54642

Own a mobile telephone						
Yes	1.90564	0.14821	8.290	0.0000	1.6362	2.21943
Freq. of listening to a radio						
Less than once a week	0.98744	0.08916	-0.140	0.8890	0.8273	1.17860
At least once a week	1.23201	0.08916	2.880	0.0040	1.0691	1.41975
Freq. of watching TV						
Less than once a week	1.16509	0.11277	1.580	0.1140	0.9638	1.40848
At least once a week	1.29040	0.15399	2.140	0.0330	1.0213	1.63044
_cons	0.09326	0.01877	-11.790	0.0000	0.0629	0.13837
Region						
var(_cons)	0.34310	0.12787			0.1653	0.71229

List Of Abbreviations

AIDS: Acquired immune deficiency syndrome

AOR: Adjusted Odds Ration

ART: Anti-Retroviral Therapy

CI: Confidence Interval

EA: Enumeration Area

EDHS: Ethiopian Demographic and Health Survey

FP: Family Planning

HAPCO: Federal HIV/AIDS Prevention and Control Office

HIV: Human Immuno Virus

HW: Health Workers

ICC: Intra class correlation

OR: Odds Ratio

PLWHIV: People living with HIV

PPS: Probability Proportionate to Size

PPS: Probability Proportionate to the Size

SD: Standard Deviation

TV: Television

UNAIDS: United Nations Program on HIV/AIDS

VCT: Voluntary Counseling and Testing

WHO: World Health Organization

Declarations

Acknowledgements

We would like to extend our gratitude to different workforces that participated in 2016 Ethiopian Demographic and Health Survey and who allowed us to access the data sets from the MEASURE DHS website.

Competing interests

The authors have declared that there are no competing interests.

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Figures

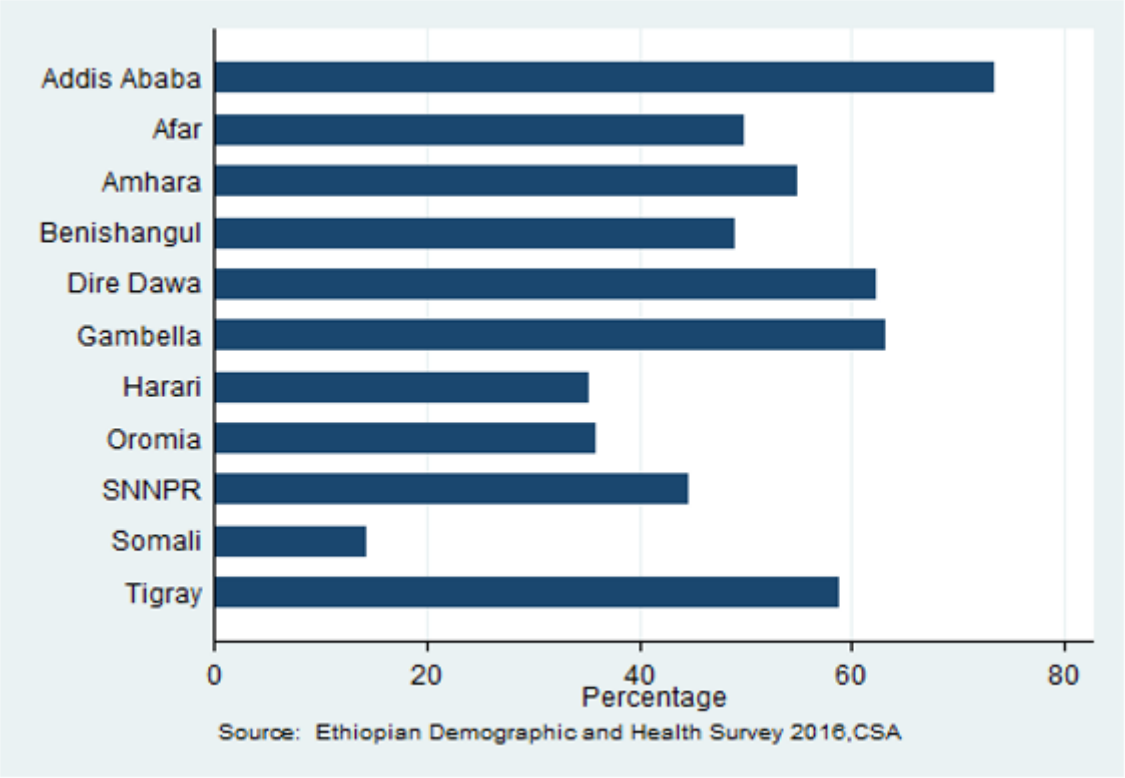

Figure 1

HIV VCT uptake among sexually active men by regions in Ethiopia, 2016 EDHS