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Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: Analysis from Nationally Representative Survey

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Abstract

Objective(s): This study is set up to explore the factors associated with Human Immunodeficiency Virus (HIV) testing among women and men in Nepal.

Study design: Nepal Demographic Health Survey (NDHS) 2016 adopts cross sectional design.

Setting: Nepal

Participants: Men and women of age15-49 years.

Primary outcome measures: Ever tested for HIV

Results: About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. In the adjusted model, among women, the odds of being tested for HIV was higher among the residents from Bagmati Province (aOR 2.0 95% CI: 1.1-3.8), Lumbini Province (aOR 2.0 95% CI: 1.1-3.8) and Sudur Paschim Province (aOR 2.0 95% CI: 1.1-3.8), women who had media exposure of at least once a week (aOR 2.0 95% CI: 1.1-3.8), and those who had their recent delivery in the health facility (aOR 2.0 95% CI: 1.1-3.8). Likewise, among men, compared to adolescents (15-19 years), those from older age groups were more likely to get tested for HIV. The odds of being tested for HIV was higher among those with secondary or higher education(aOR 2.0 95% CI: 1.1-3.8), residents of Province No. 2 (aOR 2.0 95% CI: 1.1-3.8) and Sudur Paschim Province (aOR 2.0 95% CI: 1.1-3.8), from the richer and richest wealth quintile, having comprehensive knowledge on HIV(aOR 2.0 95% CI: 1.1-3.8), those with media exposure of at least once a week (aOR 2.0 95% CI: 1.1-3.8), involved in paid sex (aOR 2.0 95% CI: 1.1-3.8)and with more sexual partners (aOR 2.0 95% CI: 1.1-3.8).

Conclusion(s): HIV testing is not widespread and there is limited attention in targeted testing to specific sub-groups. It is imperative to reach out to people engaging in risky sex behaviour, people with lower educational attainment and those in the lower wealth quintile for achieving 95-95-95 targets by 2030.

Strength and Limitation

1) This analysis is based on the most recent nationally representative survey so the findings can be generalized.
2) One of the major limitation of the cross section study is that the causal association could not be established.
3) Behavioral desirability bias might have some effect on under reporting of sexual behaviors.

Introduction

Globally, HIV is a public health issue with a disproportionate distribution of HIV epidemics.[1] HIV testing and counselling (HTC) is the first step and gateway to HIV diagnosis, treatment and prevention of new infections. HTC prevents transmission of HIV by combining tailored counseling with understanding of one's HIV status, and to persuade people to change their behaviors. [2] As an important and cost-effective HIV prevention strategy, HTC services have been widely promoted in developing countries, as part of their primary health care package.[3,4]

The Joint United Nations Programme on HIV and AIDS (UNAIDS) has a global treatment goals of 90-90-90 by 2020 and Nepal has also committed to the global goals. The treatment goals 90-90-90 aims that 90% of all people living with HIV (PLHIV) will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy and 90% of all people receiving antiretroviral therapy (ART) will have viral suppression.[5] As part of sustainable development goals (SDGs), UNAIDS aims to reach 95-95-95 targets by 2030 for epidemic control. The achievement of these targets is largely based on the effective, efficient, and targeted coverage and uptake HTC with innovative approaches. Nepal has also committed to achieve this goal in National HIV Strategic Plan 2016-2021.[6]

Worldwide 38 million (31.6 million- 44.5 million) people are estimated to have HIV. As of 2019, of all estimated PLHIV, 81% (678-95%) knew their status, 67% (54-79%) were accessing treatment and 59% (49-69%) were virally suppressed in 2019.[7] Nepal is steadily facing concentrated HIV epidemic among certain key populations (KPs) such as people who inject drugs (PWID), men who have sex with men (MSM)/male sex workers (MSWs) and transgender people in selected epidemic clusters. Nepal's HIV estimation conducted in 2019 shows that approximately 29,503 PLHIV are in Nepal, with an adult prevalence rate of 0.13%.[8] In Nepal, about 22% of the estimated PLHIV are yet to know their HIV status. Hence, it is crucial to scale up HTC service to subgroups and among people with the highest need through innovative approaches to attain a global treatment goal of 90-90-90 by 2020 as knowing HIV status is the entry point for HIV treatment, care, support and viral suppression.

Some investigators in past have examined the correlates of HIV testing in Nepal. Some of the reported factors that affect HIV testing are age, knowledge, non-condom use and socio-cultural factors such as physical assault, experience of forced sex, stigma and discrimination. [9–11] However, either these studies used the varied groups data set or were limited to certain geographical regions or KPs and lacked population levels estimates of HIV testing and its correlates. Therefore, it is imperative to conduct further analysis to explore the utilization of HTC among the general population. Additionally, this

analysis will also be useful in recommending strategies to improve the utilization of HTC services in Nepal.

Methods

Data sources

We used data from the recent Nepal Demographic Health Survey (NDHS) conducted in 2016, a nationally representative cross-sectional study. The survey was implemented by New ERA under the leadership of the Ministry of Health and Population (MoHP), with technical support from the United States Agency for International Development (USAID)'s demographic and health survey (DHS) program. Personal interviews of eligible women and men aged 15-49 in the sampled households were conducted using structured questionnaires. This study utilized data collected through two of six questionnaires administered i.e. the woman's questionnaire and the man's questionnaire. The woman's questionnaire was administered to all women age 15-49, included topics related to background characteristics, reproductive history and child mortality, family planning methods, fertility preferences, delivery care, child health, women's work, husband's characteristics, domestic violence, HIV/AIDS, and other health issues. Similarly, man's questionnaire was administered to all men aged 15-49 in the subsample of households selected for the male survey. The man's questionnaire collected information that was similar to the woman's questionnaire, although it was shorter because it did not include a detailed reproductive history or questions on maternal and child health. The total of women (n=12,862) and Men (n=4,063) from 11,040 households were interviewed in the survey. The survey involved the use of a three-stage stratified sampling technique and stratification was done by separating each province into urban and rural areas i.e. stratified and selected in two stages in rural areas and three stages in urban areas. Details of survey methodology and sampling procedure can be found in the final report published elsewhere.[12]

Definition of variable

The outcome variable for the study was "ever been HIV-tested", based on a question: 'I don't want to know the results, but have you ever been tested for HIV? The indicator was defined as having accessed HIV-testing services and received their results at least once in their lifetime prior to this survey. This question was asked to both women and men individually through women and men questionnaires respectively.

The independent variables like age, ethnicity, education, place of residence, province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, HIV discriminatory behavior, media exposure, recent sexual activity, ever paid for sex, knowledge for treatment for HIV, age at first sexual intercourse, number of lifetime sexual partners are included for both sexes. While variables like ever experienced sexual violence, received all four antenatal care (ANC), partner's education level, place of delivery, pregnant women counselled and tested for HIV are included for the analysis of women only. The list of the variables and their operational definitions are provided in the supplementary table 1.

Data analysis

Frequencies and percentages were calculated for women and men separately. Chi-square test was used to show the association of ever tested HIV and other covariates. Bivariate and Multivariate logistic regression analysis was used to obtain the adjusted effects of ever tested HIV for both male and female separately. Unadjusted and adjusted odds ratios (OR) were presented in the results, which express the magnitude in relation to the reference category in the odds (OR>1.00 or OR<1.00) of the variables of interest occurring for a given value of the explanatory variable. Level of significance was set at P-value <0.05 and 95% confidence interval (CI) were used for the statistical significance of the results. Multi-collinearity of the independent variable was checked before running multivariate models. Data analysis was conducted with STATA 15.0 software and complex sampling design was accounted for estimating standard error's (SE) through the use of Stata 'svy' commands for survey data.

Ethical considerations

NDHS 2016 was reviewed and approved by the institutional review board Nepal Health Research Council and the institutional review board of ICF Macro International; data were publicly available and did not include individual identities, and thus did not require ethical approval. We used de-identified publicly available dataset from DHS website (http://www.dhsprogram.com/data/available-datasets.cfm) for this analysis. Permission was obtained from the DHS program to use the data for further analysis.

Patient and public involvement statement

Patients and publics were not involved in this study.We analyzed the publicly accessible secondary data.

Results

Background characteristics

Women

The mean age of the women aged 15-49 years was 29 years. Most of them were Janajatis (35.8%) followed by Hill Brahmin/Chhetri (30%) and less than 20% were Dalit/Muslim/Other (17.7%) and Terai caste (16.5%). More than one third (35.1%) of the women had secondary level education whereas 33.3% did not have any formal education. Less than one fifth (16.7%) had a primary and 14.9% had higher education. Majority of them (62.8%) resided in urban areas. Nearly one fifth of the women lived in Bagmati province (21.2%) followed by province 2 (19.9%). Most of the women (76.8%) were married/living together and about half (46.7%) of women were engaged in agricultural activities as main occupation. Only about one third (32.4%) of the women had any media exposure of at least once a week (Table 2).

Men

The mean age of the men aged 15-49 years was 29.6 years. Similar to women, most of them were also Janajatis (38.1%) followed by Hill Brahmin/Chhetri (28.2%). About half of the men had higher education while about 10% did not have any formal education. Nearly two third (65.2%) lived in urban areas and about one fourth lived in Bagmati province (24.8%) followed by province 2, province 1 and Lumbini Province while less than 10% lived in other provinces like Gandaki, Sudur paschim and

Karnali. About two third of the men were married and more than two fifth were engaged in manual labor. The media exposure of at least once a week among men is lower than that of women (Table 2).

HIV and sexual behaviors among women and men

Comprehensive knowledge among women and men about HIV is not widespread i.e. about 20% of women and 28% of men have comprehensive knowledge on HIV. Two fifth (40%) of women and about one third (32.8%) of men expressed discriminatory attitudes towards PLHIV. Less than one percent of women (0.1%) and nearly 10% of men (8.7%) had recent sexual activity i.e. having sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months. Negligible percent of women and less than five percent of men (3.7%) had ever paid for sexual intercourse. The knowledge regarding treatment for HIV is higher among women (48%) than men (31%). The mean age of first sexual intercourse among women and men is 14 years and 15 years respectively. Less than five percent of women (3.2%) and 40% (4.8 in average) of men reported having multiple sexual partners in their lifetime (Table 2).

Characteristics of women related to maternal, sexual violence and others

Around 7.8% of women aged 15-49 years ever experienced sexual violence. More than two fifth of their partners were secondary in education level (44%) followed by primary (21.9%) and higher education (18.1%). Nearly 60% received all four focused ANC and 63.5% of them delivered their recent baby in the health facility. Ten percent of women who gave birth in the past two years reported that they received counseling on HIV during ANC and that they were tested for HIV and received the results (Table 2).

Proportion of HIV testing and the pattern by different characteristics among Women and Men

About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. HIV testing differed significantly by age, ethnicity, education, place of residence, province, wealth quintile, occupation, comprehensive knowledge on HIV, media exposure, age at first sexual intercourse, received all 4 ANC, partner's education level, place of delivery and pregnant women counselled and tested for HIV among women and among men, significantly differed variable with ever tested HIV are age, education, province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, media exposure, ever paid for sex and number of lifetime partners (Table 2).

Table 2: Proportion of HIV testing by socio-demographic characteristics among women and men

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
	12,862	10.8	4,063	20.5
Age				
15-19	2,598 (20.2)	4.0***	931 (22.9)	5.3***
20-24	2,251 (17.5)	14.5	649 (16.0)	20.1
25-29	2,135 (16.6)	19.1	525 (12.9)	31.4
30-39	3,378 (26.3)	12.0	1,079 (26.5)	29.9
40-49	2,500 (19.4)	5.6	879 (21.6)	19.0
Mean (SD)	29.3 (9.7)		29.6 (10.2)	
Ethnicity				

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
Hill Brahmin/Chhetri	3,855 (30.0)	16.0***	1,144 (28.2)	20.4
Terai caste	2,126 (16.5)	4.1	683 (16.8)	24.8
Janajatis	4,600 (35.8)	11.1	1,546 (38.1)	18.4
Dalit/Muslim/Other	2,281 (17.7)	7.5	689 (17.0)	21.1
Education				
No education	4,281 (33.3)	5.2***	391 (9.6)	13.1*
Primary	2,150 (16.7)	8.9	789 (19.4)	18.6
Secondary	4,516 (35.1)	11.5	1,990 (49.0)	22.1
Higher	1,915 (14.9)	23.5	893 (22.0)	22.0
Place of residence				
Urban	8,072 (62.8)	12.3**	2,647 (65.2)	20.7
Rural	4,790 (37.2)	8.2	1,416 (34.8)	20.2
Province				
Province no 1	2,173 (16.9)	9.0***	691 (17.0)	14.2***
Province no 2	2,563 (19.9)	2.8	795 (19.6)	30.3
Bagmati	2,732 (21.2)	12.9	1,009 (24.8)	18.3
Gandaki	1,249 (9.7)	12.3	376 (9.3)	20.2
Lumbini	2,274 (17.7)	14.5	658 (16.2)	19.9
Karnali	724 (5.6)	8.5	203 (5.0)	14.1
Sudurpaschim	1,145 (8.9)	19.4	330 (8.1)	22.3
Wealth quintile				
Poorest	2,176 (16.9)	8.2***	623 (15.3)	14.1***
Poorer	2,525 (19.6)	8.3	706 (17.4)	13.4
Middle	2,594 (20.2)	8.0	758 (18.7)	22.0
Richer	2,765 (21.5)	10.1	982 (24.2)	24.9
Richest	2,801 (21.8)	18.3	994 (24.5)	24.0
Marital status				
Never Married	2,669 (20.7)	2.9	1,355 (33.4)	9.1***
Married/living together	9,875 (76.8)	12.9	2,675 (65.8)	26.3
Divorced/separated/widowed	318 (2.5)	9.7	33 (0.8)	20.7
Occupation				
Did not work	4,259 (33.1)	10.5***	581 (14.3)	12.2***
Agricultural	6,011 (46.7)	8.6	1,144 (28.2)	18.2
Professional/clerical	659 (5.1)	22.4	547 (13.5)	23.7
Manual labor	1,933 (15.0)	14.1	1,786 (44.0)	23.7
Comprehensive knowledge on HIV[1]				
No	10,357 (80.5)	8.6***	2,921 (71.9)	18.6***
Yes	2,505 (19.5)	19.5	1,142 (28.1)	25.3
HIV discriminatory behavior [2]	(n=10,348)		(n=3965)	
No	6,214 (60.0)	16.2	2,663 (67.2)	21.4
Yes	4,135 (40.0)	9.2	1,302 (32.8)	20.2
Any media exposure[3]				

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
Not at all	2,062 (16.0)	4.1***	255 (6.3)	11.5**
At least once a week	4,166 (32.4)	11.7	1,144 (28.1)	24.1
Less than once a week	6,634 (51.6)	12.3	2,664 (65.6)	19.8
Recent risky sexual activity [4]				
No	12,846 (99.9)	10.8	3,709 (91.3)	20.4
Yes	16 (0.1)	22.4	354 (8.7)	22.0
Ever paid for sex				
No	12,861 (99.9)	10.8	3,911 (96.3)	19.6***
Yes	1 (0.01)	0.0	152 (3.7)	44.7
Knowledge for treatment for HIV[5]	(n=10,348)		(n=3,965)	
No/Don't know	5,390 (52.1)	12.8	2,729 (68.8)	20.2
Yes	4,959 (47.9)	14.0	1,236 (31.2)	22.8
Age at first sexual intercourse[6]	(n=10,157)		(n=3,083)	
<15 years	1161 (11.4)	8.2***	136 (4.4)	21.1
15-19 years	6574 (64.7)	11.6	1515 (49.1)	24.4
20-24 years	2052 (20.2)	19.5	1022 (33.1)	25.2
25 and above years	370 (3.7)	22.7	410 (13.3)	28.5
Mean (SD)	14.0 (7.7)		15.1(9.1)	
Number of lifetime sexual partners[6]	(n=10, 207)		(n=3097)	
1	9,877 (96.8)	12.9	1,857 (60.0)	22.1**
2+	330 (3.2)	12.0	1,240 (40.0)	29.4
Mean (SD)	1.04 (0.46)		2.36 (4.83)	
Ever experienced sexual violence[7]	(n=4,421)			
Not experienced	4,075 (92.2)	11.9	-	-
Experienced	346 (7.8)	10.1	-	-
Received all 4 ANC[8]	(n=3,762)			
Not received	1,550 (41.2)	11.2***	-	-
Received	2,212 (58.8)	28.0	-	-
Partner's education level[9]	(n=9,852)			
No education	1,575 (16.0)	4.1***	-	-
Primary	2,158 (21.9)	7.8	-	-
Secondary	4,337 (44.0)	13.7	-	-
Higher	1,782 (18.1)	25.2	-	-
Place of recent delivery[10]	(n=3,997)			
Elsewhere	1,459 (36.5)	6.3***	-	-
Health facility	2,539 (63.5)	28.2	-	-
Pregnant women counselled and tested for HIV[11]	(n=1,978)			
No	1,780 (90.0)	15.6***	-	-
Yes	198 (10.0)	100.0	-	-

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)

[1]Comprehensive knowledge means knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chance of getting HIV, knowing that a healthy-looking person can have HIV, and rejecting the two most common local misconceptions about transmission or prevention of HIV.
[2] HIV discriminatory behavior was asked among the respondents who have heard of HIV or AIDS and discriminatory attitude means those who do not think that children living with HIV should be able to attend school with children who are HIV negative or would not buy fresh vegetables from a shopkeeper who has HIV
[3] Media exposure means reads a newspaper, watches television and listens to the radio
[4] Had sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months
[5] Knowledge for treatment for HIV was asked among the respondents who have heard of HIV or AIDS
[6] Not had sexual intercourse and inconsistent in the data were excluded from the analysis
[7] Sexual violence questions were asked to the women age 15-49 from the selected households and who were chosen for administering domestic violence module. And Sexual violence is defined as those women who have experienced any sexual violence (committed by a husband or anyone else) ever before the survey. Here we have applied women's weight instead of domestic violence weight because our unit of analysis comes from the women's file.so, the figure might be different from the main report.
[8] Received ANC at 4, 6, 8, and 9 months and it is based on the number of women with ANC for their most recent birth 5 years preceding the survey.
[9] The respondents for partner's education are based on the currently married women. Further few "Don't know" cases were excluded from the analysis.
[10] Regardless of live birth, the figure is based on the number of women who had delivered in the 5 years preceding the survey.
[11] This includes the number of women who gave birth in the past 2 years and the women who did not receive antenatal care for their last birth in the past 2 years
*** p<0.001, ** p<0.01, * p<0.05 (chi-square test)

Factors associated with HIV testing among women and men

Table 3 presents the unadjusted and adjusted OR from the binary logistic regression analysis that illustrates the odds of women and men had ever tested HIV. An adjusted model was used to adjust the effects of independent characteristics and the results are presented in the table.

Women from Bagmati province (aOR=2.0; 95%CI =1.1-3.8), Lumbini province (aOR=2.3; 95% CI=1.1-4.8) and Sudur Paschim province (aOR=3.3, 95% CI=1.5-7.0) were more likely to have tested for HIV compared to the women from province 1. Women who had a media exposure at least once a week had 2.8 times (aOR=2.8; 95% CI= 1.4-5.3) higher odds of having HIV testing compared to those who hadn't been exposed to media at all. Those women who had their recent delivery to a health facility were more likely (aOR=3.9; 95% CI=2.4-6.3) to have HIV testing compared to those who had delivered her recent babies other than the health facility (Table 3).

Men with age 20 years and above were more likely to have HIV testing compared to the age 15-19 years. Similarly, compared to no education, men with secondary and higher education were more likely to have HIV testing. Men from province 2 (aOR=3.5; 95% CI=2.0-6.2) and Sudurpaschim province (aOR=1.6; 95% CI= 1.0-2.4) had higher odds of having HIV testing compared to the province 1. Men

with richer (aOR=1.6; 95% CI=1.1-2.4) and richest (aOR=1.6; 95% CI=1.0-2.4) quintiles were also more likely to have HIV testing compared to the poorest quintile of wealth. Men who had comprehensive knowledge of HIV had higher odds (aOR=1.4; 95% CI=1.1 - 1.8) of having HIV testing compared to those who don't have a comprehensive knowledge. Similar to the women, men with media exposure at least once a week were more likely (aOR=1.7; 95% CI=1.0 - 3.1) to have HIV testing compared to those who hadn't been exposed to media at all. Further, men who ever paid for sex (aOR=2.1, 95% CI= 1.3 - 3.4) and had 2+ sexual partners (aOR=1.6; 95% CI=1.2 - 2.0) in their lifetime were more likely to have HIV testing compared to the men who didn't paid and had only one sex partners respectively (Table 3).

Table 3: Unadjusted and Adjusted Odds Ratio (OR) of HIV testing among women and men

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age				
15-19	ref.	ref.	ref.	ref.
20-24	4.0*** (3.1-5.2)	1.4 (0.6 - 3.2)	4.5***(3.0-6.7)	3.9*** (2.1 - 7.2)
25-29	5.6***(4.3-7.3)	1.7 (0.8 - 3.6)	8.2**(5.1-13.2)	6.4*** (3.3 - 12.1)
30-39	3.2*** (2.5-4.2)	1.9 (0.8 - 4.5)	7.6***(5.1-11.3)	5.5*** (3.0 - 10.2)
40-49	1.4 (0.9-1.9)	0.2 (0.01 - 1.9)	4.2***(2.6-6.6)	3.0*** (1.6 - 5.7)
Ethnicity				
Hill Brahmin/Chhetri	ref.	ref.	ref.	ref.
Terai caste	0.2***(0.2-0.3)	0.6 (0.3 - 1.2)	1.3(0.9-1.8)	0.7 (0.4 - 1.1)
Janajatis	0.6*** (0.5-0.8)	1.1 (0.7 - 1.8)	0.9(0.7-1.1)	0.9 (0.7 - 1.2)
Dalit/Muslim/Other	0.4***(0.3-0.6)	1.4 (0.8 - 2.4)	1.0(0.7-1.5)	1.0 (0.6 - 1.6)
Education				
No education	ref.	ref.	ref.	ref.
Primary	1.8***(1.4-2.3)	0.8 (0.4 - 1.6)	1.5 (0.9-2.3)	1.5 (0.9 - 2.3)
Secondary	2.3***(1.9-2.9)	1.4 (0.7 - 2.6)	1.9**(1.2-2.8)	2.3*** (1.4 - 3.6)
Higher	5.6***(4.4-7.0)	2.1 (0.9 - 4.2)	1.9**(1.2-2.9)	1.7* (1.0 - 2.8)
Place of residence				
Urban	ref.	ref.	ref.	ref.
Rural	0.6**(o.5-0.8)	1.1 (0.8 - 1.7)	0.9 (0.7-1.3)	1.1 (0.8 - 1.5)
Province				
Province no 1	ref.	ref.	ref.	ref.
Province no 2	0.3(0.2-0.4)	0.8 (0.3 - 1.8)	2.6***(1.7-4.1)	3.5***(2.0 - 6.2)
Bagmati	1.5* (1.0-2.2)	2.0* (1.1 - 3.8)	1.3(0.9-2.0)	1.2 (0.8 - 1.8)
Gandaki	1.4(0.9-2.0)	1.4 (0.8 - 2.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.4)
Lumbini	1.7*(1.1-2.6)	2.3* (1.1 - 4.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.5)
Karnali	0.9 (0.6-1.4)	1.9 (0.9 - 4.0)	0.9(0.6-1.6)	1.1 (0.6 - 1.8)
Sudurpaschim	2.4*** (1.6-3.6)	3.3** (1.5 - 7.0)	1.7*(1.1-2.7)	1.6* (1.0 - 2.4)
Wealth quintile				
Poorest	ref.	ref.	ref.	ref.
Poorer	1.0 (0.7-1.3)	1.0 (0.6 - 1.7)	0.9 (0.7-1.3)	0.9 (0.6 - 1.3)
Middle	0.9 (0.7-1.3)	1.0 (0.5 - 1.9)	1.7** (1.2-2.5)	1.3 (0.9 - 2.0)
Richer	1.2 (0.9-1.7)	0.9 (0.5 - 1.6)	2.0***(1.4-2.9)	1.6* (1.1 - 2.4)

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Richest	2.5***(1.8-3.4)	1.5 (0.7 - 3.1)	1.9***(1.3-2.8)	1.7* (1.1 - 2.6)
Occupation				
Did not work	ref.	ref.	ref.	ref.
Agricultural	0.8*(0.6-0.9)	0.7 (0.4 - 1.1)	1.6*(1.1-2.4)	0.8 (0.4 - 1.3)
Professional/clerical	2.4***(1.9-3.1)	1.2 (0.6 - 2.3)	2.2***(1.5-3.4)	0.7 (0.4 - 1.2)
Manual labor	1.4**(1.1-1.7)	0.6 (0.3 - 1.1)	2.2***(1.6-3.2)	0.7 (0.4 - 1.2)
Comprehensive knowledge on HIV				
No	ref.	ref.	ref.	ref.
Yes	2.6***(2.2-2.9)	1.0 (0.7 - 1.5)	1.5***(1.2-1.8)	1.4* (1.1 - 1.8)
HIV discriminatory behavior				
No	ref.	ref.	ref.	ref.
Yes	0.5***(0.4-0.6)	0.7 (0.5 - 1.0)	0.9 (0.8-1.1)	1.2 (0.9 - 1.6)
Any media exposure				
Not at all	ref.	ref.	ref.	ref.
At least once a week	3.1***(2.3-4.1)	2.8** (1.4 - 5.3)	2.4***(1.5-3.9)	1.7* (1.0 - 3.1)
Less than once a week	3.3***(2.5-4.3)	1.4 (0.7 - 2.6)	1.9**(1.2-3.0)	1.3 (0.8 - 2.3)
Recent risky sexual activity				
No	-	-	ref.	ref.
Yes	-	-	1.1 (0.7-1.6)	0.8 (0.5 - 1.2)
Ever paid for sex				
No	-	-	ref.	ref.
Yes	-	-	3.3***(2.1-5.2)	2.1** (1.3 - 3.4)
Knowledge for treatment for HIV				
No	ref.	ref.	ref.	ref.
Yes	1.1(0.9-1.3)	1.1 (0.8 - 1.6)	1.2 (0.9-1.4)	1.2 (0.9 - 1.5)
Age at first sexual intercourse				
>15 years	ref.	ref.	ref.	ref.
15-19 years	1.4**(1.1-1.8)	1.2 (0.6 - 2.3)	1.2 (0.8-1.9)	1.3 (0.8 - 2.1)
20-24 years	2.7***(2.1-3.5)	0.7 (0.3 - 1.5)	1.3 (0.8-2.0)	1.1 (0.7 - 2.0)
25 and above years	3.3***(2.2-4.9)	1.3 (0.5 - 3.5)	1.5 (0.8-2.6)	1.6 (0.9 - 2.8)
Number of lifetime sexual partners				
1	ref.	ref.	ref.	ref.
2+	0.9 (0.6-1.5)	0.9 (0.2 - 3.0)	1.5**(1.2-1.8)	1.6*** (1.2 - 2.0)
Ever experienced sexual violence				
Not experienced	ref.	ref.	-	-
Experienced	0.8 (0.6-1.2)	1.8 (0.9 - 3.3)	-	-

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Received all 4 ANC				
Not received	ref.	ref.	-	-
Received	3.1***(2.4-3.9)	1.2 (0.8 - 1.8)	-	-
Partner's education level				
No education	ref.	ref.	-	-
Primary	1.9***(1.4-2.7)	1.6 (0.6 - 3.7)	-	-
Secondary	3.7***(2.8-5.0)	1.8 (0.7 - 4.5)	-	-
Higher	7.9***(5.8-10.8)	2.0 (0.8 - 5.4)	-	-
Place of recent delivery				
Elsewhere	ref.	ref.	-	-
Health facility	5.7***(4.9-6.5)	3.9*** (2.4 - 6.3)		
*** p<0.001, ** p<0.01, * p<0.05 (t-statistic)				

Discussion

It was noted that men were more likely to test for HIV than women. One of the reason for this can be men's engagement in high risk behavior and high rate of migration among male in Nepal[13], high risk perception and better health seeking behavior and access to HTC services. The National HIV Strategic Plan 2016-21 identifies clients of FSWs, and migrants as some of the KPs and various HIV related programs are targeted at improving HIV testing behavior among migrants[6]. In the integrated bio-behavioral surveillance (IBBS) survey, it is reported that men practice high-risk sexual behavior compared to females in contrast to findings from Nairobi [14],where females were more likely to get tested. Analysis of IBBS done among KPs in Nepal also suggest that about 50% of the HIV testing coverage among FSWs and MSM and Transgender people[10] Likewise the IBBS shows only 18.6% of male labor migrants and one-third (35%) of migrants wives have utilized HTC service.[15,16]

Male who were in the age-group (20-24 years) were more likely to get tested. Some other studies also reported the similar findings.[17,18] The potential reason for this age-group to be tested could be also be tied with the prime age of migration.[11] Education was also found to be a determining factor for HIV testing, the most possible explanation could be higher understanding and awareness about the testing services and its benefits. Higher education was also a determining factor for utilization of HIV testing in different counties.[17–20] In addition to education, HIV related knowledge was the significant correlates of being tested for HIV among men. This is confirmed by study conducted in Kenya [21], Canada [22], sub-Saharan Africa.[23] As reported in other research that presents the global and regional context [24–27], being in a higher economic quintile was associated with HIV testing. HIV testing is provided free in Nepal but higher testing among participants at higher economic quintile may be related to the higher risk behavior and involvement in risky sex behavior among these groups.[11]

Despite the Government of Nepal strategy to expand HIV testing services as part of Prevention of Mother to Child Transmission (PMTCT), not all women who received all 4 ANCs were tested for HIV. Similarly, other critical area is the HIV services for those surviving sexual violence. Further, women experiencing sexual violence are also being missed out from the recommended HIV counselling and services; only 10 percent of total women who reported of experiencing sexual violence in the recent

years had tested for HIV. It is unclear if they even received post exposure prophylaxis (PEP) services as per WHO recommendation. [28]

HIV testing services varied by provinces which is explained by the disproportionate distribution of HIV in the country. Province no.2 is one of the most affected provinces as it borders India and is one of the provinces with migrants to India.[29] Lumbini Province and Sudur Paschim Province has the highest case finding rate (1.6% and 1.5% respectively).[30] Based on the HIV size estimation, Province no.2, Lumbini province and Sudurpaschim have higher number of migrants living with HIV.[31] Major occupation in the province is through labor migration to India. There are evidences of engagement of the migrant population in higher risky behaviors in India.[32] This could be linked with the variation of HIV testing among migrant populations in each province.

It is estimated that around 29,503 are PLHIV, however only 70 percent are currently on ART which falls far short of the UNAIDS goal of 90-90-90 by 2020.[33] It is evident that even the high risk groups (those having paid sex or those reporting recent sexual behavior with person other than their spouse or regular partner) are not receiving HIV testing services.[34]

These findings clearly indicate the need to reach populations in lower economic quintile and illiterate populations as they were less likely to get tested. Considering the KPs such as FSWs or migrants; nearly one-fourth (37%) were illiterate or had no formal schooling.[35] HIV testing coverage can be improved with the innovative and targeted approaches including engagement of community-lay providers as well as targeting the sexual, injecting or social network partners of PLHIV.[33]

Conclusion:

HIV testing is not widespread and there is limited attention in targeted testing to specific sub-groups with innovative approaches. Despite national strategy to roll out PMTCT throughout the country, still only one quarter of women who received four ANC received HTC services. It is imperative to reach out to people engaging in risky sex behavior, people with lower educational attainment and those in the lower wealth quintile for achieving 95-95-95 targets by 2030 as a part of SDGs.

Data Availability

All relevant data are available from the corresponding author upon a reasonable request.

Abbreviations

ANC: Ante-Natal Care
aOR: Adjusted Odds Ratio
ART: Anti-Retroviral Therapy
CI: Confidence Interval
DHS: Demographic and Health Survey
FSW: Female Sex Workers
HIV: Human Immunodeficiency Virus
HTC: HIV Testing and Counselling
MSM: Men who have Sex with Men
MSWs: Male Sex Workers
NGOs: Non-Governmental Organization
MoHP: Ministry of Health and Population

NDHS: Nepal Demographic and Health Surveys
PLHIV: People Living with HIV
PMTCT: Prevention of Mother to Child Transmission
PWID: People Who Inject Drugs
SD: Standard Deviation
SE: Standard Error
WHO: World Health Organization

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Contributions
NB and KB involved in the design and conception of the study. KA and NB involved in the analysis and interpretation of the findings; KA, NB, RT and KB involved in the write up of the manuscript. All authors read and approved the final manuscript.

Ethics declarations
Ethics approval and consent to participate
Permission for data access was obtained from Measure DHS upon the request from http://www.dhsprogram.com. Written consent was obtained from all the participants before interviewing during the survey. The data used for this study were publicly available without a personal identifier.

Consent for publication
Not applicable.

Competing interests
All authors declare that they have no competing interest in the final content of the study.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any pre specified hypotheses	2-3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4
		(*b*) Describe any methods used to examine subgroups and interactions	4
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	4
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Not applicable
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	5-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11
		(*b*) Report category boundaries when continuous variables were categorized	5-11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: Analysis from Nationally Representative Survey

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Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: Analysis from Nationally Representative Survey

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Abstract

Objective(s): This study is set up to explore the factors associated with HIV testing among women and men in Nepal.

Study design: Nepal Demographic and Health Survey, 2016 adopts a cross-sectional design.

Setting: Nepal

Participants: Women and men of age 15-49 years.

Primary outcome measures: Our primary outcome was ever tested for HIV. We used multivariable analysis at a 95% level of significance to measure the effect in outcome variables.

Results: About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. Women who had media exposure at least once a week (aOR= 2.8; 95% CI: 1.4-5.3) were more likely to get tested for HIV compared to those who had no media exposure at all. Similarly, those who had their recent delivery in the health facility (aOR= 3.9; 95% CI: 2.4-6.3) were more likely to get tests for HIV compared to those delivered elsewhere. Likewise, among men, compared to adolescents (15-19 years), those from older age groups were more likely to get tested for HIV. Compared to no education, secondary (aOR= 2.3; 95% CI: 1.4-3.6) and higher education (aOR= 1.7; 95% CI: 1.0-2.8) had higher odds of getting tested for HIV. Similarly, wealth quintiles in richer and richest groups were more likely to get tested for HIV compared with the poorest quintile. Other characteristics like media exposure, paid sex, and more sexual partners were positively associated with being tested for HIV.

Conclusion(s): HIV testing is not widespread and more male than female is accessing HIV services. Only a quarter of women who completed four antenatal care visits received HIV testing and counseling services. It is imperative to reach out to people engaging in risky sexual behavior, people with lower educational attainment, and those in the lower wealth quintile for achieving 95-95-95 targets by 2030.

Strength and Limitation

1) This analysis is based on the most recent nationally representative survey so the findings can be generalized.
2) One of the major limitations of the cross-sectional study is that the causal association could not be established.
3) Behavioral desirability bias might have some effect on under reporting of sexual behaviors.

Introduction

Globally, HIV is a public health issue with a disproportionate distribution of HIV epidemics.[1] Worldwide 38 million (31.6 million- 44.5 million) people are estimated to have HIV. As of 2020, of all estimated PLHIV, 81% (678-95%) knew their status, 67% (54-79%) were accessing treatment and 59% (49-69%) were virally suppressed in 2020.[2] The Joint United Nations Program on HIV and AIDS (UNAIDS) has a global treatment goals of 90-90-90 by 2020 and Nepal has also committed to the global goal. The treatment goals of 90-90-90 aims that 90% of all people living with HIV (PLHIV) will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy and 90% of all people receiving antiretroviral therapy (ART) will achieve viral suppression.[3] As part of sustainable development goals (SDGs), UNAIDS aims to reach 95-95-95 targets by 2030 for epidemic control. The achievement of these targets is largely based on the effective, efficient, and targeted coverage and uptake HTC with innovative approaches. Nepal commits to this global goal as set out in the National HIV Strategic Plan 2016-2021.[4]

Nepal is steadily facing a concentrated HIV epidemic among certain key populations (KPs) such as people who inject drugs (PWID), men who have sex with men (MSM)/male sex workers (MSWs) and transgender people in selected epidemic clusters. Nepal's HIV estimation conducted in 2019 shows that approximately 29,503 PLHIV are in Nepal, with an adult prevalence rate of 0.13%.[5] In Nepal, about 22% of the estimated PLHIV do not know their HIV status. Hence, it is crucial to scale up HTC service to subgroups and among people with the highest need through innovative approaches to attain a global treatment goal of 90-90-90 by 2020 as knowing one's HIV status is the entry point for HIV treatment, care, support and viral suppression.

HIV testing and counselling (HTC) is the first step and gateway to HIV diagnosis, treatment and prevention of new infections. HTC prevents transmission of HIV by combining tailored counseling with understanding of one's HIV status, and to persuade people to change their behaviors. [6] As an important and cost-effective HIV prevention strategy, HTC services have been widely promoted in developing countries, as part of their primary health care package.[7,8]

Few authors in past have examined the correlates of HIV testing in Nepal. Some of the reported factors that affect HIV testing are age, knowledge, non-condom use and socio-cultural factors such as physical assault, experience of forced sex, stigma and discrimination. [9–11] However, either these studies used the previous round of DHS data set[11] or were limited to certain geographical regions[9] or KPs[10] and lacked population level estimates of HIV testing and its correlates. Therefore, it is imperative to conduct further analysis to explore the utilization of HTC among the general population with most recent data.

Additionally, this analysis will also be useful in recommending strategies to improve the utilization of HTC services in Nepal.

Methods

Data sources

We used data from the recent Nepal Demographic Health Survey (NDHS) conducted in 2016, a nationally representative cross-sectional study. The survey was implemented by New ERA under the leadership of the Ministry of Health and Population (MoHP), with technical support from the United States Agency for International Development (USAID)'s demographic and health survey (DHS) program. Personal interviews of eligible women and men aged 15-49 in the sampled households were conducted using structured questionnaires. This study utilized data collected through two of six questionnaires administered i.e., the woman's questionnaire and the man's questionnaire. The woman's questionnaire was administered to all women age 15-49 and, included topics related to background characteristics, reproductive history and child mortality, family planning methods, fertility preferences, delivery care, child health, women's work, husband's characteristics, domestic violence, HIV/AIDS, and other health issues. Similarly, man's questionnaire was administered to all men aged 15-49 in the subsample of households selected for the male survey. The man's questionnaire collected information that was similar to the woman's questionnaire, although it was shorter because it did not include a detailed reproductive history or questions on maternal and child health. The total of women (n=12,862) and men (n=4,063) from 11,040 households were interviewed in the survey (Figure1). The survey involved the use of a three-stage stratified sampling technique and stratification was done by separating each province into urban and rural areas i.e., stratified and selected in two stages in rural areas and three stages in urban areas. Details of survey methodology and sampling procedure can be found in the final report published elsewhere.[12]

Figure 1 [To be inserted here]

Fig 1: Flow chart showing the sampling of study

Definition of variable

The outcome variable for the study was "ever been HIV-tested", based on a question: 'I don't want to know the results, but have you ever been tested for HIV? The indicator was defined as having accessed HIV-testing services at least once in their lifetime prior to this survey. This question was asked to both women's and men's individually through women and men questionnaires respectively.

The independent variables like age, ethnicity, education, place of residence, province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, HIV discriminatory behavior, media exposure, recent sexual activity, ever paid for sex, knowledge for treatment for HIV, age at first sexual

intercourse, number of lifetime sexual partners are included for both sexes. While variables like ever experienced sexual violence, received all four antenatal care (ANC), partner's education level, place of delivery, pregnant women counselled and tested for HIV are included for the analysis of women only. The list of the variables and their operational definitions are provided in the supplementary table 1.

Data analysis

Frequencies and percentages were calculated for women and men separately. Chi-square test was used to show the association of ever tested HIV and other covariates. Bivariable and multivariable binary logistic regression analysis was used to obtain the adjusted effects of ever tested HIV for both male and female separately. Unadjusted and adjusted odds ratios (OR) were presented in the results, which express the magnitude in relation to the reference category in the odds (OR>1.00 or OR<1.00) of the variables of interest occurring for a given value of the explanatory variable. Level of significance was set at P-value <0.05 and a 95% confidence interval (CI) was used for the statistical significance of the results. Multi-collinearity of the independent variable was checked before running multivariate models. We used sampling weights (provided in datasets) separately for women and men to adjust for variations in the selection probabilities and interviews. The "svyset" command was used in weighting the data and to account for complex survey design and to provide unbiased estimate. Data analysis was conducted with STATA 15.0 (Stata Corp, College Station Texas, USA).

Patient and public involvement statement

Patients and publics were not involved in this study. We analyzed the publicly accessible secondary data.

Results

Background characteristics

This analysis is limited to 12, 862 women and 4,063 men among the women and men interviewed in NDHS 2016. The background characteristics and proportion of ever tested HIV by women and men is presented below.

Women

The mean age of the women aged 15-49 years was 29 years. Most of them were Janajatis (35.8%) followed by Hill Brahmin/Chhetri (30%) and less than 20% were Dalit/Muslim/Other (17.7%) and Terai caste (16.5%). More than one third (35.1%) of the women had secondary level education whereas 33.3% did not have any formal education. Less than one fifth (16.7%) had a primary education and 14.9% had higher education. The majority of women (62.8%) resided in urban areas. Nearly one fifth of the women lived in Bagmati province (21.2%) followed by province 2 (19.9%) (Fig 2). Most of the women (76.8%) were married/living together and about half (46.7%) of women were engaged in agricultural activities as main occupation. Only about one third (32.4%) of the women had any media exposure of at least once a week (Table 1).

Men

The mean age of the men aged 15-49 years was 29.6 years. Similar to women, most of them were also Janajatis (38.1%) followed by Hill Brahmin/Chhetri (28.2%). About half of the men had higher

education while about 10% did not have any formal education. Nearly two thirds (65.2%) lived in urban areas and about one fourth lived in Bagmati province (24.8%). About two thirds of the men were married and more than two-fifths were engaged in manual labor. The media exposure of at least once a week among men is lower than that of women (Table 1)

HIV and sexual behaviors among women and men

Comprehensive knowledge among women and men about HIV is not widespread i.e., about 20% of women and 28% of men have comprehensive knowledge on HIV. Two-fifths (40%) of women and about one third (32.8%) of men expressed discriminatory attitudes towards PLHIV. Less than one percent of women (0.1%) and nearly 10% of men (8.7%) had recent sexual activity i.e., having sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months. A negligible percent of women and less than five percent of men (3.7%) had ever paid for sexual intercourse. The knowledge regarding treatment for HIV is higher among women (48%) than men (31%). The mean age of first sexual intercourse among women and men is 14 years and 15 years respectively. Less than five percent of women (3.2%) and 40% (4.8 in average) of men reported having multiple sexual partners in their lifetime (Table 1).

Proportion of HIV testing and the pattern by different characteristics among women and men

About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. HIV testing differed significantly by age, ethnicity, education, place of residence, province, wealth quintile, occupation, comprehensive knowledge on HIV, media exposure, age at first sexual intercourse, received all 4 ANC, partner's education level, place of delivery and pregnant women counselled and tested for HIV among women and among men, by age, education, province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, media exposure, ever paid for sex and number of lifetime partners (Table 1, Fig 2).

Figure 2 [To be inserted here]

Fig 2 : Proportion of ever tested HIV by Men (A), by Women (B)

Table 1: Proportion of HIV testing by socio-demographic characteristics among women and men

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
	12,862	10.8	4,063	20.5
Age				
15-19	2,598 (20.2)	4.0***	931 (22.9)	5.3***
20-24	2,251 (17.5)	14.5	649 (16.0)	20.1
25-29	2,135 (16.6)	19.1	525 (12.9)	31.4

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
30-39	3,378 (26.3)	12.0	1,079 (26.5)	29.9
40-49	2,500 (19.4)	5.6	879 (21.6)	19.0
Mean (SD)	29.3 (9.7)		29.6 (10.2)	
Ethnicity				
Hill Brahmin/Chhetri	3,855 (30.0)	16.0***	1,144 (28.2)	20.4
Terai caste	2,126 (16.5)	4.1	683 (16.8)	24.8
Janajatis	4,600 (35.8)	11.1	1,546 (38.1)	18.4
Dalit/Muslim/Other	2,281 (17.7)	7.5	689 (17.0)	21.1
Education				
No education	4,281 (33.3)	5.2***	391 (9.6)	13.1*
Primary	2,150 (16.7)	8.9	789 (19.4)	18.6
Secondary	4,516 (35.1)	11.5	1,990 (49.0)	22.1
Higher	1,915 (14.9)	23.5	893 (22.0)	22.0
Place of residence				
Urban	8,072 (62.8)	12.3**	2,647 (65.2)	20.7
Rural	4,790 (37.2)	8.2	1,416 (34.8)	20.2
Wealth quintile				
Poorest	2,176 (16.9)	8.2***	623 (15.3)	14.1***
Poorer	2,525 (19.6)	8.3	706 (17.4)	13.4
Middle	2,594 (20.2)	8.0	758 (18.7)	22.0
Richer	2,765 (21.5)	10.1	982 (24.2)	24.9
Richest	2,801 (21.8)	18.3	994 (24.5)	24.0
Marital status				
Never Married	2,669 (20.7)	2.9	1,355 (33.4)	9.1***
Married/living together	9,875 (76.8)	12.9	2,675 (65.8)	26.3
Divorced/separated/widowed	318 (2.5)	9.7	33 (0.8)	20.7
Occupation				
Did not work	4,259 (33.1)	10.5***	581 (14.3)	12.2***
Agricultural	6,011 (46.7)	8.6	1,144 (28.2)	18.2
Professional/clerical	659 (5.1)	22.4	547 (13.5)	23.7
Manual labor	1,933 (15.0)	14.1	1,786 (44.0)	23.7
Comprehensive knowledge on HIV				
No	10,357 (80.5)	8.6***	2,921 (71.9)	18.6***
Yes	2,505 (19.5)	19.5	1,142 (28.1)	25.3
HIV discriminatory behavior	(n=10,348)		(n=3965)	
No	6,214 (60.0)	16.2	2,663 (67.2)	21.4
Yes	4,135 (40.0)	9.2	1,302 (32.8)	20.2
Any media exposure				
Not at all	2,062 (16.0)	4.1***	255 (6.3)	11.5**
At least once a week	4,166 (32.4)	11.7	1,144 (28.1)	24.1
Less than once a week	6,634 (51.6)	12.3	2,664 (65.6)	19.8
Recent risky sexual activity				

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
No	12,846 (99.9)	10.8	3,709 (91.3)	20.4
Yes	16 (0.1)	22.4	354 (8.7)	22.0
Ever paid for sex				
No	12,861 (99.9)	10.8	3,911 (96.3)	19.6***
Yes	1 (0.01)	0.0	152 (3.7)	44.7
Knowledge for treatment for HIV	(n=10,348)		(n=3,965)	
No/Don't know	5,390 (52.1)	12.8	2,729 (68.8)	20.2
Yes	4,959 (47.9)	14.0	1,236 (31.2)	22.8
Age at first sexual intercourse	(n=10,157)		(n=3,083)	
<15 years	1161 (11.4)	8.2***	136 (4.4)	21.1
15-19 years	6574 (64.7)	11.6	1515 (49.1)	24.4
20-24 years	2052 (20.2)	19.5	1022 (33.1)	25.2
25 and above years	370 (3.7)	22.7	410 (13.3)	28.5
Mean (SD)	14.0 (7.7)		15.1(9.1)	
Number of lifetime sexual partners	(n=10, 207)		(n=3097)	
1	9,877 (96.8)	12.9	1,857 (60.0)	22.1**
2+	330 (3.2)	12.0	1,240 (40.0)	29.4
Mean (SD)	1.04 (0.46)		2.36 (4.83)	
*** p<0.001, ** p<0.01, * p<0.05 (chi-square test)				

Characteristics of women related to maternal, sexual violence and others

Around 7.8% of women aged 15-49 years ever experienced sexual violence. More than two-fifths of their partners achieved secondary education (44%) followed by primary (21.9%) and higher education (18.1%). Nearly 60% received all four focused ANC visits and 63.5% of them delivered their most recent baby in the health facility. Ten percent of women who gave birth in the past two years reported that they received counseling on HIV during ANC and that they were ever tested for HIV (Table 2).

Table 2: Proportion of HIV testing by characteristics related to violence among women, pregnancy and delivery related services

Characteristics	Women	
	Total, n (%)	Ever tested HIV (%)
Ever experienced sexual violence	(n=4,421)	
Not experienced	4,075 (92.2)	11.9
Experienced	346 (7.8)	10.1
Received all 4 ANC	(n=3,762)	
Not received	1,550 (41.2)	11.2***
Received	2,212 (58.8)	28.0
Partner's education level	(n=9,852)	
No education	1,575 (16.0)	4.1***
Primary	2,158 (21.9)	7.8
Secondary	4,337 (44.0)	13.7

Characteristics	Women	
	Total, n (%)	Ever tested HIV (%)
Higher	1,782 (18.1)	25.2
Place of recent delivery	(n=3,997)	
Elsewhere	1,459 (36.5)	6.3***
Health facility	2,539 (63.5)	28.2
Pregnant women counselled and tested for HIV	(n=1,978)	
No	1,780 (90.0)	15.6***
Yes	198 (10.0)	100.0

Factors associated with HIV testing among women and men

Table 3 presents the unadjusted and adjusted OR from the binary logistic regression analysis that illustrates the odds of women and men had ever tested HIV. An adjusted model was used to adjust the effects of independent characteristics. All the variables were used in the multivariable model but only the variable that turned significant in the adjusted analysis are presented in the table. The result with all the variables is provided in the supplementary table 2.

Women from Bagmati province (aOR=2.0; 95%CI =1.1-3.8), Lumbini province (aOR=2.3; 95% CI=1.1-4.8) and Sudurpaschim province (aOR=3.3, 95% CI=1.5-7.0) were more likely to have tested for HIV compared to the women from province 1. Women who had a media exposure at least once a week had 2.8 times (aOR=2.8; 95% CI= 1.4-5.3) higher odds of having HIV testing compared to those who hadn't been exposed to media at all. Those women who had their recent delivery at a health facility were more likely (aOR=3.9; 95% CI=2.4-6.3) to have HIV testing compared to those who had delivered her recent babies somewhere other than the health facility (Table 3).

Men aged 20 years and above were more likely to have HIV testing compared to those between age 15-19 years of age. Similarly, compared to no education, men with secondary and higher education were more likely to have HIV testing. Men from province 2 (aOR=3.5; 95% CI=2.0-6.2) and Sudurpaschim province (aOR=1.6; 95% CI= 1.0-2.4) had higher odds of having HIV testing compared to the province 1. Men with richer (aOR=1.6; 95% CI=1.1-2.4) and richest (aOR=1.6; 95% CI=1.0-2.4) quintiles were also more likely to have HIV testing compared to the poorest quintile of wealth. Men who had comprehensive knowledge of HIV had higher odds (aOR=1.4; 95% CI=1.1 - 1.8) of having HIV testing compared to those who don't have a comprehensive knowledge. Similar to the women, men with media exposure at least once a week were more likely (aOR=1.7; 95% CI=1.0 - 3.1) to have HIV testing compared to those who hadn't been exposed to media at all. Further, men who ever paid for sex (aOR=2.1, 95% CI= 1.3 - 3.4) and had 2+ sexual partners (aOR=1.6; 95% CI=1.2 - 2.0) in their lifetime were more likely to have HIV testing compared to the men who hadn't paid for sex and had only one sex partner respectively (Table 3).

Table 3: Unadjusted and Adjusted Odds Ratio (OR) of HIV testing among women and men

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age				

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
15-19	ref.	ref.	ref.	ref.
20-24	4.0*** (3.1-5.2)	1.4 (0.6 - 3.2)	4.5***(3.0-6.7)	3.9*** (2.1 - 7.2)
25-29	5.6***(4.3-7.3)	1.7 (0.8 - 3.6)	8.2**(5.1-13.2)	6.4*** (3.3 - 12.1)
30-39	3.2*** (2.5-4.2)	1.9 (0.8 - 4.5)	7.6***(5.1-11.3)	5.5*** (3.0 - 10.2)
40-49	1.4 (0.9-1.9)	0.2 (0.01 - 1.9)	4.2***(2.6-6.6)	3.0*** (1.6 - 5.7)
Education				
No education	ref.	ref.	ref.	ref.
Primary	1.8***(1.4-2.3)	0.8 (0.4 - 1.6)	1.5 (0.9-2.3)	1.5 (0.9 - 2.3)
Secondary	2.3***(1.9-2.9)	1.4 (0.7 - 2.6)	1.9**(1.2-2.8)	2.3*** (1.4 - 3.6)
Higher	5.6***(4.4-7.0)	2.1 (0.9 - 4.2)	1.9**(1.2-2.9)	1.7* (1.0 - 2.8)
Province				
Province no 1	ref.	ref.	ref.	ref.
Province no 2	0.3(0.2-0.4)	0.8 (0.3 - 1.8)	2.6***(1.7-4.1)	3.5***(2.0 - 6.2)
Bagmati	1.5* (1.0-2.2)	2.0* (1.1 - 3.8)	1.3(0.9-2.0)	1.2 (0.8 - 1.8)
Gandaki	1.4(0.9-2.0)	1.4 (0.8 - 2.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.4)
Lumbini	1.7*(1.1-2.6)	2.3* (1.1 - 4.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.5)
Karnali	0.9 (0.6-1.4)	1.9 (0.9 - 4.0)	0.9(0.6-1.6)	1.1 (0.6 - 1.8)
Sudurpaschim	2.4*** (1.6-3.6)	3.3** (1.5 - 7.0)	1.7*(1.1-2.7)	1.6* (1.0 - 2.4)
Wealth quintile				
Poorest	ref.	ref.	ref.	ref.
Poorer	1.0 (0.7-1.3)	1.0 (0.6 - 1.7)	0.9 (0.7-1.3)	0.9 (0.6 - 1.3)
Middle	0.9 (0.7-1.3)	1.0 (0.5 - 1.9)	1.7** (1.2-2.5)	1.3 (0.9 - 2.0)
Richer	1.2 (0.9-1.7)	0.9 (0.5 - 1.6)	2.0***(1.4-2.9)	1.6* (1.1 - 2.4)
Richest	2.5***(1.8-3.4)	1.5 (0.7 - 3.1)	1.9***(1.3-2.8)	1.7* (1.1 - 2.6)
Comprehensive knowledge on HIV				
No	ref.	ref.	ref.	ref.
Yes	2.6***(2.2-2.9)	1.0 (0.7 - 1.5)	1.5***(1.2-1.8)	1.4* (1.1 - 1.8)
Any media exposure				
Not at all	ref.	ref.	ref.	ref.
At least once a week	3.1***(2.3-4.1)	2.8** (1.4 - 5.3)	2.4***(1.5-3.9)	1.7* (1.0 - 3.1)
Less than once a week	3.3***(2.5-4.3)	1.4 (0.7 - 2.6)	1.9**(1.2-3.0)	1.3 (0.8 - 2.3)
Ever paid for sex				
No	-	-	ref.	ref.
Yes	-	-	3.3***(2.1-5.2)	2.1** (1.3 - 3.4)
Number of lifetime sexual partners				
1	ref.	ref.	ref.	ref.
2+	0.9 (0.6-1.5)	0.9 (0.2 - 3.0)	1.5**(1.2-1.8)	1.6*** (1.2 - 2.0)
Place of recent delivery				
Elsewhere	ref.	ref.	-	-
Health facility	5.7***(4.9-6.5)	3.9*** (2.4 - 6.3)		
*** p<0.001, ** p<0.01, * p<0.05 (t-statistic)				

Discussion

More men than women opted for HIV testing. This could be explained partly by men's engagement in high risk behavior and high rate of migration among male in Nepal[13];high risk perception and better health seeking behavior and access to HTC services. The National HIV Strategic Plan 2016-21 identifies clients of FSWs, and migrants as high-risk populations and various HIV related programs are targeted at improving HIV testing behavior among migrants[4]. In the integrated bio-behavioral surveillance (IBBS) survey, authors report that men practice high-risk sexual behavior compared to females. The findings are in contrast to the testing behavior in Nairobi [14],where females were more likely to get tested. Analysis of IBBS among KPs in Nepal suggest that about 50% of the HIV testing coverage among FSWs and MSM and Transgender people[10]. Per the IBBS report, only 18.6% of male labor migrants and one-third (35%) of migrants wives have utilized HTC service.[15,16]

Men who were in the age-group (20-24 years) were more likely to get tested. Some other studies also reported similar findings.[17,18] The potential reason for this age-group to be tested could be also be tied with the prime age of migration.[11] Education was also found to be a determining factor for HIV testing, the most possible explanation could be higher understanding and awareness about the testing services and its benefits. Higher education was also a determining factor for utilization of HIV testing in different counties.[17–20] In addition to education, HIV related knowledge was the significant correlates of being tested for HIV among men. This is confirmed by studies conducted in Kenya [21], Canada [22], and sub-Saharan Africa.[23] As reported in various studies undertaken at the global and regional level[24–27], being in a higher economic quintile was associated with HIV testing. It is to be noted that HIV testing is free in Nepal but higher testing among participants at higher economic quintile may be related to the higher risk behavior and involvement in risky sex behavior among these groups.[11]

Despite the Government of Nepal strategy to expand HIV testing services as part of prevention of mother to child transmission (PMTCT), not all women who received all 4 ANCs were tested for HIV. Similarly, other critical area is the HIV services for those surviving sexual violence. Further, women experiencing sexual violence are also being missed from the recommended HIV counselling and services; only 10 percent of total women who reported experiencing sexual violence in the recent years had tested for HIV. It is unclear if they even received post exposure prophylaxis (PEP) services as per WHO recommendation. [28]

HIV testing services varied by provinces [29]which is explained by the disproportionate distribution of HIV in the country. Province no.2 is one of the most affected provinces as it borders India and is one of the provinces with migrants to India.[30] Lumbini Province and Sudurpaschim Province has the highest case finding rate (1.6% and 1.5% respectively).[31] Based on the HIV size estimation, Province no.2, Lumbini province and Sudurpaschim have a higher number of migrants living with HIV.[32] Major occupation in the province is through labor migration to India. There is evidence of engagement of the migrant population in higher risky behaviors in India.[33] This could be linked with the variation of HIV testing among migrant populations in each province. Service availability and readiness is also a key indicator for the HIV testing among men and women. Authors report persistent gaps in staff, guidelines and medicine and commodities for HIV testing and treatment in Nepal which could also potentially impact the HIV service uptake[29]. Further comprehensive knowledge on HIV and media exposure were among the determinants for HIV testing, thus, indicating the need to continue or upscale such program.

The HIV estimates in 2019 shows that there are 29,503 PLHIV in the country, however about only two-thirds are currently on ART which falls short of the UNAIDS goal of 90-90-90 by 2020.[34] It is evident that even the high risk groups (those having paid sex or those reporting recent sexual behavior with person other than their spouse or regular partner) are not receiving HIV testing services.[35]

These findings clearly indicate the need to reach populations in lower economic quintile and illiterate populations as they were less likely to get tested. Considering the KPs such as FSWs or migrants; nearly one-fourth (37%) were illiterate or had no formal schooling.[36] HIV testing coverage can be improved with the innovative and targeted approaches including engagement of community-lay providers as well as targeting the sexual, injecting or social network partners of PLHIV.[34]

Our study utilized the most recent nationally representative data and assessed gender disaggregated HTC service uptake and correlates among general population. Our study has some limitations. This analysis used the data from cross sectional study so that the causal association could not be established. Behavioral desirability bias might have some effect on under reporting of sexual behaviors. The analysis was limited to the available variables included in the NDHS.

Conclusion:

HIV testing is not widespread and more men than women are accessing HIV services. Despite the national strategy to roll out PMTCT throughout the country, only a quarter of women who completed four ANC visited received HTC services. HTC services are a critical service for women experiencing sexual violence. However, only 1 in 10 women experiencing sexual based violence received HIV testing. Media exposure and comprehensive knowledge on HIV are critical determinants for HIV testing, therefore, the National HIV program should focus on strengthening social behavior change communication interventions. It is imperative to reach out to people engaging in risky sex behavior, people with lower educational attainment and those in the lower wealth quintile for achieving 95-95-95 targets by 2030 as a part of SDGs.

Data availability statement

Data are available in a public, open access repository. The datasets generated during the current study are available from within the Demographic and Health Survey Program repository (https://dhsprogram.com/data/ available-datasets.cfm).

Abbreviations

ANC: Ante-Natal Care
aOR: Adjusted Odds Ratio
ART: Anti-Retroviral Therapy
CI: Confidence Interval
DHS: Demographic and Health Survey
FSW: Female Sex Workers
HIV: Human Immunodeficiency Virus
HTC: HIV Testing and Counselling
MSM: Men who have Sex with Men
MSWs: Male Sex Workers

NGOs: Non-Governmental Organization
MoHP: Ministry of Health and Population
NDHS: Nepal Demographic and Health Surveys
PLHIV: People Living with HIV
PMTCT: Prevention of Mother to Child Transmission
PWID: People Who Inject Drugs
SD: Standard Deviation
SE: Standard Error
WHO: World Health Organization

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Contributions
NB and KB involved in the design and conception of the study. KA and NB involved in the analysis and interpretation of the findings; KA, NB, RT and KB involved in the write up of the manuscript. BS supervised, reviewed and edited the manuscript. All authors read and approved the final manuscript.

Ethical approval

NDHS 2016 was reviewed and approved by the institutional review board Nepal Health Research Council and the institutional review board of ICF Macro International. Written consent was obtained from all the participants before interviewing during the survey. We used de-identified data publicly available from the DHS website (http://www.dhsprogram.com/data/available-datasets.cfm), and thus did not require ethical approval for this study. Permission was obtained from the DHS program to use the data for further analysis.

Consent for publication
Not applicable.

Competing interests
All authors declare that they have no competing interest in the final content of the study.

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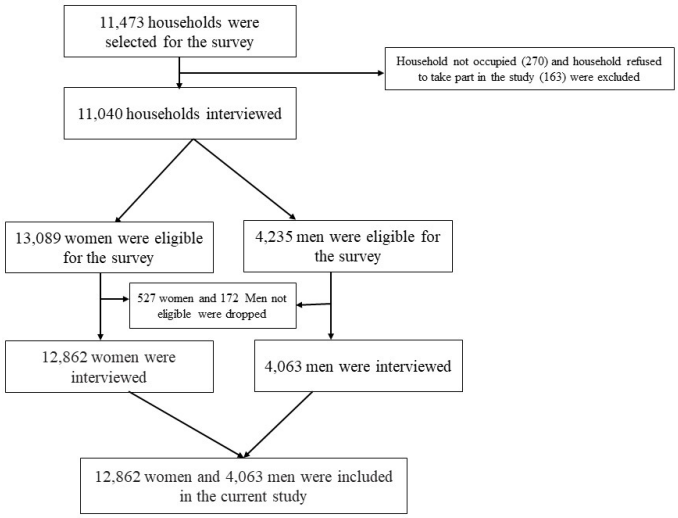

Fig 1:Flow chart showing the sampling of study

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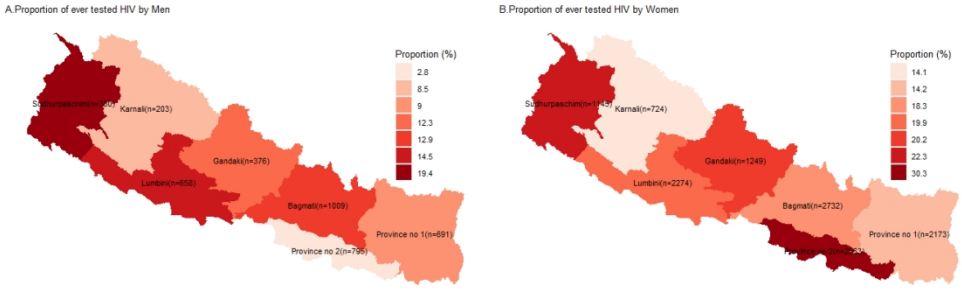

Fig 2: Proportion of ever tested HIV by Men (A), by Women (B)

913x471mm (38 x 38 DPI)

Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: Analysis from Nationally Representative Survey

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Supplementary Table 1: List of variables and their operational definitions

Independent Variables	Definitions	Categories
Age (years)	Completed age of the women and men at the time of data collection	1) 15-19 2) 20-24 3) 25-29 4) 30-39 5) 40-49
Ethnicity	Ethnic categories are that an individual's falls in the Nepalese context	1) Hill Brahamin/Chettri 2) Terai Caste 3) Janajatis 4) Dalit/Muslims/Others
Education	Level of education classified as per the years of schooling/grades	1) No education 2) Primary (basic education with incomplete secondary education) 3) Secondary education (completed secondary education) 4) Higher education (higher than secondary)
Place of residence	Residence areas of respondents	1) Urban 2) Rural
Province	Administrative unit.	1) Province no. 1 2) Province no. 2 3) Bagmati Province 4) Gandaki Province 5) Province 5

		6) Karnali Province 7) Sudhurpaschim Province
Wealth quintile	Composite measure of a household's cumulative living standard, calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities.The wealth index score of each item is divided into quintile.	1) Poorest 2) Poorer 3) Middle 4) Richer 5) Richest
Marital status	Current marital status of the respondents (women and men).	1) Never married 2) Married/living together 3) Divorced/separated/widowed
Occupation	Women and men employed in the 12 months preceding the survey by occupation.	1) Didn't work 2) Agricultural 3) Professional/clerical 4) Manual labor
Comprehensive knowledge on HIV	Comprehensive knowledge means knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chance of getting HIV, knowing that a healthy-looking person can have HIV, and rejecting the two most common local misconceptions about transmission or prevention of HIV.	1) No 2) Yes
HIV discriminatory behaviour	HIV discriminatory behavior was asked among the respondents who have heard of HIV or AIDS and discriminatory attitude means those who do not think that children living with HIV should be able to attend school with children who are HIV negative or would not buy fresh vegetables from a shopkeeper who has HIV.	1) No 2) Yes

Media exposure	Media exposure means reading a newspaper, watching television and listening to the radio.	1) Not at all 2) At Least once a week 3) Less than once a week
Recent sexual activity	Women and men had sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months.	1) No 2) Yes
Ever paid for sex	Those who ever paid anyone in exchange for having sexual intercourse.	1) No 2) Yes
Knowledge for treatment for HIV	Knowledge for treatment for HIV was asked among the respondents who have heard of HIV or AIDS. This is the knowledge regarding the availability of HIV treatment.	1) No 2) Yes
Age at first sexual intercourse (years)	Age of woman or man in completed years when they had first sex.	1) <15 2) 15-19 3) 20-24 4) 25 and above
Number of lifetime sexual partners	Women and men aged 15-49, who had two or more sexual partners in their lifetime.	1) 1 2) 2+
Ever experienced sexual violence	Sexual violence is defined as those women who have experienced any sexual violence (committed by a husband or anyone else) ever before the survey. Sexual violence questions were asked to the women age 15-49 from the selected households and who were chosen for administering domestic violence module.	1) Not experienced 2) Experienced
Received all 4 ANC	Women received ANC at 4, 6, 8, and 9 months and it is based on the number of women with ANC for their most recent birth 5 years preceding the survey.	1) Not received 2) Received
Women's partners' education	Level of education of women's husband classified as per the years of schooling/grades.	1) No education 2) Primary (basic education with incomplete secondary education)

		3) Secondary education (completed secondary education) 4) Higher education (higher than secondary)
Place of recent delivery	Women who had delivered in the 5 years preceding the survey.	1) Elsewhere 2) Health facility
Pregnant women counselled and tested for HIV	Women who gave birth and did not receive antenatal care for their last birth in the past 2 years preceding the survey.	1) No 2) Yes

Supplementary table 2: Unadjusted and Adjusted Odds Ratio (OR) of HIV testing among women and men

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age				
15-19	ref.	ref.	ref.	ref.
20-24	4.0*** (3.1-5.2)	1.4 (0.6 - 3.2)	4.5***(3.0-6.7)	3.9*** (2.1 - 7.2)
25-29	5.6***(4.3-7.3)	1.7 (0.8 - 3.6)	8.2**(5.1-13.2)	6.4*** (3.3 - 12.1)
30-39	3.2*** (2.5-4.2)	1.9 (0.8 - 4.5)	7.6***(5.1-11.3)	5.5*** (3.0 - 10.2)
40-49	1.4 (0.9-1.9)	0.2 (0.01 - 1.9)	4.2***(2.6-6.6)	3.0*** (1.6 - 5.7)
Ethnicity				
Hill Brahmin/Chhetri	ref.	ref.	ref.	ref.
Terai caste	0.2***(0.2-0.3)	0.6 (0.3 - 1.2)	1.3(0.9-1.8)	0.7 (0.4 - 1.1)
Janajatis	0.6*** (0.5-0.8)	1.1 (0.7 - 1.8)	0.9(0.7-1.1)	0.9 (0.7 - 1.2)
Dalit/Muslim/Other	0.4***(0.3-0.6)	1.4 (0.8 - 2.4)	1.0(0.7-1.5)	1.0 (0.6 - 1.6)
Education				
No education	ref.	ref.	ref.	ref.
Primary	1.8***(1.4-2.3)	0.8 (0.4 - 1.6)	1.5 (0.9-2.3)	1.5 (0.9 - 2.3)
Secondary	2.3***(1.9-2.9)	1.4 (0.7 - 2.6)	1.9**(1.2-2.8)	2.3*** (1.4 - 3.6)
Higher	5.6***(4.4-7.0)	2.1 (0.9 - 4.2)	1.9**(1.2-2.9)	1.7* (1.0 - 2.8)
Place of residence				
Urban	ref.	ref.	ref.	ref.
Rural	0.6**(o.5-0.8)	1.1 (0.8 - 1.7)	0.9 (0.7-1.3)	1.1 (0.8 - 1.5)
Province				
Province no 1	ref.	ref.	ref.	ref.
Province no 2	0.3(0.2-0.4)	0.8 (0.3 - 1.8)	2.6***(1.7-4.1)	3.5***(2.0 - 6.2)
Bagmati	1.5* (1.0-2.2)	2.0* (1.1 - 3.8)	1.3(0.9-2.0)	1.2 (0.8 - 1.8)

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gandaki	1.4(0.9-2.0)	1.4 (0.8 - 2.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.4)
Lumbini	1.7*(1.1-2.6)	2.3* (1.1 - 4.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.5)
Karnali	0.9 (0.6-1.4)	1.9 (0.9 - 4.0)	0.9(0.6-1.6)	1.1 (0.6 - 1.8)
Sudurpaschim	2.4*** (1.6-3.6)	3.3** (1.5 - 7.0)	1.7*(1.1-2.7)	1.6* (1.0 - 2.4)
Wealth quintile				
Poorest	ref.	ref.	ref.	ref.
Poorer	1.0 (0.7-1.3)	1.0 (0.6 - 1.7)	0.9 (0.7-1.3)	0.9 (0.6 - 1.3)
Middle	0.9 (0.7-1.3)	1.0 (0.5 - 1.9)	1.7** (1.2-2.5)	1.3 (0.9 - 2.0)
Richer	1.2 (0.9-1.7)	0.9 (0.5 - 1.6)	2.0***(1.4-2.9)	1.6* (1.1 - 2.4)
Richest	2.5***(1.8-3.4)	1.5 (0.7 - 3.1)	1.9***(1.3-2.8)	1.7* (1.1 - 2.6)
Occupation				
Did not work	ref.	ref.	ref.	ref.
Agricultural	0.8*(0.6-0.9)	0.7 (0.4 - 1.1)	1.6*(1.1-2.4)	0.8 (0.4 - 1.3)
Professional/clerical	2.4***(1.9-3.1)	1.2 (0.6 - 2.3)	2.2***(1.5-3.4)	0.7 (0.4 - 1.2)
Manual labor	1.4**(1.1-1.7)	0.6 (0.3 - 1.1)	2.2***(1.6-3.2)	0.7 (0.4 - 1.2)
Comprehensive knowledge on HIV				
No	ref.	ref.	ref.	ref.
Yes	2.6***(2.2-2.9)	1.0 (0.7 - 1.5)	1.5***(1.2-1.8)	1.4* (1.1 - 1.8)
HIV discriminatory behavior				
No	ref.	ref.	ref.	ref.
Yes	0.5***(0.4-0.6)	0.7 (0.5 - 1.0)	0.9 (0.8-1.1)	1.2 (0.9 - 1.6)
Any media exposure				
Not at all	ref.	ref.	ref.	ref.
At least once a week	3.1***(2.3-4.1)	2.8** (1.4 - 5.3)	2.4***(1.5-3.9)	1.7* (1.0 - 3.1)
Less than once a week	3.3***(2.5-4.3)	1.4 (0.7 - 2.6)	1.9**(1.2-3.0)	1.3 (0.8 - 2.3)
Recent risky sexual activity				
No	-	-	ref.	ref.
Yes	-	-	1.1 (0.7-1.6)	0.8 (0.5 - 1.2)
Ever paid for sex				
No	-	-	ref.	ref.
Yes	-	-	3.3***(2.1-5.2)	2.1** (1.3 - 3.4)
Knowledge for treatment for HIV				
No	ref.	ref.	ref.	ref.
Yes	1.1(0.9-1.3)	1.1 (0.8 - 1.6)	1.2 (0.9-1.4)	1.2 (0.9 - 1.5)
Age at first sexual intercourse				
>15 years	ref.	ref.	ref.	ref.
15-19 years	1.4**(1.1-1.8)	1.2 (0.6 - 2.3)	1.2 (0.8-1.9)	1.3 (0.8 - 2.1)

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
20-24 years	2.7***(2.1-3.5)	0.7 (0.3 - 1.5)	1.3 (0.8-2.0)	1.1 (0.7 - 2.0)
25 and above years	3.3***(2.2-4.9)	1.3 (0.5 - 3.5)	1.5 (0.8-2.6)	1.6 (0.9 - 2.8)
Number of lifetime sexual partners				
1	ref.	ref.	ref.	ref.
2+	0.9 (0.6-1.5)	0.9 (0.2 - 3.0)	1.5**(1.2-1.8)	1.6*** (1.2 - 2.0)
Ever experienced sexual violence				
Not experienced	ref.	ref.	-	-
Experienced	0.8 (0.6-1.2)	1.8 (0.9 - 3.3)	-	-
Received all 4 ANC				
Not received	ref.	ref.	-	-
Received	3.1***(2.4-3.9)	1.2 (0.8 - 1.8)	-	-
Partner's education level				
No education	ref.	ref.	-	-
Primary	1.9***(1.4-2.7)	1.6 (0.6 - 3.7)	-	-
Secondary	3.7***(2.8-5.0)	1.8 (0.7 - 4.5)	-	-
Higher	7.9***(5.8-10.8)	2.0 (0.8 - 5.4)	-	-
Place of recent delivery				
Elsewhere	ref.	ref.	-	-
Health facility	5.7***(4.9-6.5)	3.9*** (2.4 - 6.3)		
*** p<0.001, ** p<0.01, * p<0.05 (t-statistic)				

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any pre specified hypotheses	2-3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4
		(*b*) Describe any methods used to examine subgroups and interactions	4
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	4
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Not applicable
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	5-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11
		(*b*) Report category boundaries when continuous variables were categorized	5-11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: A Cross-sectional Study Using Data from a Nationally Representative Survey

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Abstract

Objective(s): This study is set up to explore the factors associated with HIV testing among women and men in Nepal.

Study design: Nepal Demographic and Health Survey, 2016 adopts a cross-sectional design.

Setting: Nepal

Participants: Women and men of age 15-49 years.

Primary outcome measures: Our primary outcome was ever tested for HIV. We used multivariable analysis at a 95% level of significance to measure the effect in outcome variables.

Results: About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. Women who had media exposure at least once a week (aOR= 2.8; 95% CI: 1.4-5.3) were more likely to get tested for HIV compared to those who had no media exposure at all. Similarly, those who had their recent delivery in the health facility (aOR= 3.9; 95% CI: 2.4-6.3) were more likely to get tests for HIV compared to those delivered elsewhere. Likewise, among men, compared to adolescents (15-19 years), those from older age groups were more likely to get tested for HIV. Compared to no education, secondary (aOR= 2.3; 95% CI: 1.4-3.6) and higher education (aOR= 1.7; 95% CI: 1.0-2.8) had higher odds of getting tested for HIV. Similarly, wealth quintiles in richer and richest groups were more likely to get tested for HIV compared with the poorest quintile. Other characteristics like media exposure, paid sex, and 2+sexual partners were positively associated with being tested for HIV.

Conclusion(s): HIV testing is not widespread and more men than women are accessing HIV services. More than two-thirds of women who delivered at health facilities never tested for HIV. It is imperative to reach out to people engaging in risky sexual behavior, people with lower educational attainment, and those in the lower wealth quintile for achieving 95-95-95 targets by 2030.

Strength and Limitation

1) This analysis is based on the most recent nationally representative survey.
2) One of the major limitations of the cross-sectional study is that the causal association could not be established.
3) Behavioral desirability bias might have some effect on under reporting of sexual behaviors.

Introduction

Globally, HIV is a public health issue with a disproportionate distribution of the epidemics.[1] Worldwide 37.7 million (30.2 million- 45.1 million) people are estimated to have HIV. As of 2020, of all estimated PLHIV, 84% (67->98%) knew their status, 73% (56-88%) were accessing treatment and 66% (53-79%) were virally suppressed in 2020.[2] The Joint United Nations Program on HIV and AIDS (UNAIDS) has a global treatment goals of 90-90-90 by 2020 and Nepal has also committed to the global goal. The treatment goals of 90-90-90 aims that 90% of all people living with HIV (PLHIV) will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy and 90% of all people receiving antiretroviral therapy (ART) will achieve viral suppression.[3] As part of sustainable development goals (SDGs), UNAIDS aims to reach 95-95-95 targets by 2030 for epidemic control. The achievement of these targets is largely based on the effective, efficient, and targeted coverage and uptake of HIV testing and counselling (HTC) with innovative approaches. Nepal commits to this global goal as set out in the National HIV Strategic Plan 2016-2021.[4]

Nepal is steadily facing a concentrated HIV epidemic among certain key populations (KPs) such as people who inject drugs (PWID), men who have sex with men (MSM)/male sex workers (MSWs) and transgender people in selected epidemic clusters. Nepal's HIV estimation undertaken in 2019 shows that approximately 29,503 PLHIV are in Nepal, with an adult prevalence rate of 0.13%.[5] In Nepal, about 22% of the estimated PLHIV do not know their HIV status. Hence, it is crucial to scale up HTC service to subgroups and among people with the highest need through innovative approaches to attain a global treatment goal of 90-90-90 by 2020 as knowing one's HIV status is the entry point for HIV treatment, care, support and viral suppression and ending AIDS by 2030.

HTC is the first step and gateway to HIV diagnosis, treatment and prevention of new infections. HTC prevents transmission of HIV by combining tailored counselling with understanding of one's HIV status, and to persuade people to change their behaviors.[6] As an important and cost-effective HIV prevention strategy, HTC services have been widely promoted in developing countries, as part of their primary health care package.[7,8]

Few authors in past have examined the correlates of HIV testing in Nepal. Some of the reported factors that affect HIV testing are age, knowledge, non-use of condom and socio-cultural factors such as physical assault, experience of forced sex, stigma and discrimination.[9–11] However, either these studies used the previous round of Nepal Demographic and Health Survey (NDHS) data set[11] or were limited to certain geographical regions[9] or KPs[10] and lacked population level estimates of HIV testing and its correlates. Therefore, it is imperative to conduct further analysis to explore the utilization of HTC

among the general population with most recent data. Additionally, this analysis will also be useful in recommending strategies to improve the utilization of HTC services in Nepal.

Methods

Data sources

We used data from the recent NDHS conducted in 2016, a nationally representative cross-sectional study. The survey was implemented by New ERA under the leadership of the Ministry of Health and Population (MoHP), with technical support from the United States Agency for International Development (USAID)'s DHS program. Personal interviews of eligible women and men aged 15-49 years in the sampled households were conducted using structured questionnaires. This study utilized data collected through two of six questionnaires administered i.e., the woman's questionnaire and the man's questionnaire. The woman's questionnaire was administered to all women age 15-49 years and, included topics related to background characteristics, reproductive history and child mortality, family planning methods, fertility preferences, delivery care, child health, women's work, husband's characteristics, domestic violence, HIV/AIDS, and other health issues. Similarly, man's questionnaire was administered to all men aged 15-49 years in the subsample of households selected for the male survey. The man's questionnaire collected information that was similar to the woman's questionnaire, although it was shorter because it did not include a detailed reproductive history or questions on maternal and child health. A total of 12,862 women and 4,063 men from 11,040 households were interviewed in the survey (Figure1). The survey involved the use of a three-stage stratified sampling technique and stratification was done by separating each province into urban and rural areas i.e., stratified and selected in two stages in rural areas and three stages in urban areas. Details of survey methodology and sampling procedure can be found in the final report published elsewhere.[12]

Figure 1 [To be inserted here]

Fig 1: Flow chart showing the sampling of study

Definition of variable

The outcome variable for the study was "ever been HIV-tested", based on a question: 'I don't want to know the results, but have you ever been tested for HIV? The indicator was defined as having accessed HIV-testing services at least once in their lifetime prior to this survey. This question was asked to both women's and men's individually.

The independent variables like age, ethnicity, education, place of residence, province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, HIV discriminatory behavior, media exposure, recent sexual activity, ever paid for sex, knowledge for treatment for HIV, age at first sexual intercourse, number of lifetime sexual partners are included for both sexes. While variables like ever

experienced sexual violence, received all four antenatal care (ANC), partner's education level and place of delivery are included for the analysis of women only. The list of the variables and their operational definitions are provided in the supplementary table 1.

Data analysis

Frequencies and percentages were calculated for women and men separately. Chi-square test was used to show the association of ever tested HIV and other covariates. Bivariable and multivariable binary logistic regression analysis was used to obtain the adjusted effects of ever tested HIV for both men and women separately. Unadjusted and adjusted odds ratios (OR) were presented in the results, which express the magnitude in relation to the reference category in the odds (OR>1.00 or OR<1.00) of the variables of interest occurring for a given value of the explanatory variable. Level of significance was set at P-value <0.05 and a 95% confidence interval (CI) was used for the statistical significance of the results. Multi-collinearity of the independent variable was checked before running multivariate models. We used sampling weights (provided in datasets) separately for women and men to adjust for variations in the selection probabilities and interviews. The "svyset" command was used in weighting the data and to account for complex survey design and to provide unbiased estimate. Data analysis was conducted with STATA 15.0 (Stata Corp, College Station Texas, USA).

Patient and public involvement statement

Patients and publics were not involved in this study. We analyzed the publicly accessible secondary data.

Results

Background characteristics

This analysis is limited to 12, 862 women and 4,063 men among the total interviewed in NDHS 2016. The background characteristics and proportion of ever tested HIV by women and men is presented below.

Women

The mean age of the women aged 15-49 years was 29 years. Most of them were Janajatis (35.8%) followed by Hill Brahmin/Chhetri (30%) and less than 20% were Dalit/Muslim/Other (17.7%) and Terai caste (16.5%). More than one third (35.1%) of the women had secondary level education whereas 33.3% did not have any formal education. Less than one fifth (16.7%) had a primary education and 14.9% had higher education. The majority of women (62.8%) resided in urban areas. Nearly one fifth of the women lived in Bagmati Province (21.2%) followed by Province no 2 (19.9%) (Fig 2). Most of the women (76.8%) were married/living together and about half (46.7%) of women were engaged in agricultural activities as main occupation. Only about one third (32.4%) of the women had any media exposure of at least once a week (Table 1).

Men

The mean age of the men aged 15-49 years was 29.6 years. Similar to women, most of them were also Janajatis (38.1%) followed by Hill Brahmin/Chhetri (28.2%). About half of the men had higher education while about 10% did not have any formal education. Nearly two thirds (65.2%) lived in

urban areas and about one fourth lived in Bagmati Province (24.8%). About two thirds of the men were married and more than two-fifths were engaged in manual labor. The media exposure of at least once a week among men is lower than that of women (Table 1)

HIV and sexual behaviors among women and men

Comprehensive knowledge among women and men about HIV is not widespread i.e., about 20% of women and 28% of men have comprehensive knowledge on HIV. Two-fifths (40%) of women and about one third (32.8%) of men expressed discriminatory attitudes towards PLHIV. Less than one percent of women (0.1%) and nearly 10% of men (8.7%) had recent sexual activity i.e., having sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months. A negligible percent of women and less than five percent of men (3.7%) had ever paid for sexual intercourse. The knowledge regarding treatment for HIV is higher among women (48%) than men (31%). The mean age of first sexual intercourse among women and men is 14 years and 15 years respectively. Less than five percent of women (3.2%) and 40% (4.8 in average) of men reported having multiple sexual partners in their lifetime (Table 1).

Proportion of HIV testing and the pattern by different characteristics among women and men

About one in ten women (10.8%) and one in five men (20.5%) ever tested for HIV. HIV testing differed significantly by age, ethnicity, education, place of residence, province, wealth quintile, occupation, comprehensive knowledge on HIV, media exposure, age at first sexual intercourse, received all 4 ANC, partner's education level and place of delivery among women and among men, by age, education, Province, wealth quintile, marital status, occupation, comprehensive knowledge on HIV, media exposure, ever paid for sex and number of lifetime partners (Table 1, Fig 2).

Figure 2 [To be inserted here]

Fig 2: Proportion of ever tested HIV by Men (A), by Women (B)

Table 1: Proportion of HIV testing by socio-demographic characteristics among women and men

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
	12,862	10.8	4,063	20.5
Age				
15-19	2,598 (20.2)	4.0***	931 (22.9)	5.3***
20-24	2,251 (17.5)	14.5	649 (16.0)	20.1
25-29	2,135 (16.6)	19.1	525 (12.9)	31.4
30-39	3,378 (26.3)	12.0	1,079 (26.5)	29.9
40-49	2,500 (19.4)	5.6	879 (21.6)	19.0
Mean (SD)	29.3 (9.7)		29.6 (10.2)	

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
Ethnicity				
Hill Brahmin/Chhetri	3,855 (30.0)	16.0***	1,144 (28.2)	20.4
Terai caste	2,126 (16.5)	4.1	683 (16.8)	24.8
Janajatis	4,600 (35.8)	11.1	1,546 (38.1)	18.4
Dalit/Muslim/Other	2,281 (17.7)	7.5	689 (17.0)	21.1
Education				
No education	4,281 (33.3)	5.2***	391 (9.6)	13.1*
Primary	2,150 (16.7)	8.9	789 (19.4)	18.6
Secondary	4,516 (35.1)	11.5	1,990 (49.0)	22.1
Higher	1,915 (14.9)	23.5	893 (22.0)	22.0
Place of residence				
Urban	8,072 (62.8)	12.3**	2,647 (65.2)	20.7
Rural	4,790 (37.2)	8.2	1,416 (34.8)	20.2
Wealth quintile				
Poorest	2,176 (16.9)	8.2***	623 (15.3)	14.1***
Poorer	2,525 (19.6)	8.3	706 (17.4)	13.4
Middle	2,594 (20.2)	8.0	758 (18.7)	22.0
Richer	2,765 (21.5)	10.1	982 (24.2)	24.9
Richest	2,801 (21.8)	18.3	994 (24.5)	24.0
Marital status				
Never Married	2,669 (20.7)	2.9	1,355 (33.4)	9.1***
Married/living together	9,875 (76.8)	12.9	2,675 (65.8)	26.3
Divorced/separated/widowed	318 (2.5)	9.7	33 (0.8)	20.7
Occupation				
Did not work	4,259 (33.1)	10.5***	581 (14.3)	12.2***
Agricultural	6,011 (46.7)	8.6	1,144 (28.2)	18.2
Professional/clerical	659 (5.1)	22.4	547 (13.5)	23.7
Manual labor	1,933 (15.0)	14.1	1,786 (44.0)	23.7
Comprehensive knowledge on HIV				
No	10,357 (80.5)	8.6***	2,921 (71.9)	18.6***
Yes	2,505 (19.5)	19.5	1,142 (28.1)	25.3
HIV discriminatory behavior	(n=10,348)		(n=3965)	
No	6,214 (60.0)	16.2	2,663 (67.2)	21.4
Yes	4,135 (40.0)	9.2	1,302 (32.8)	20.2
Any media exposure				
Not at all	2,062 (16.0)	4.1***	255 (6.3)	11.5**
At least once a week	4,166 (32.4)	11.7	1,144 (28.1)	24.1
Less than once a week	6,634 (51.6)	12.3	2,664 (65.6)	19.8
Recent risky sexual activity				
No	12,846 (99.9)	10.8	3,709 (91.3)	20.4
Yes	16 (0.1)	22.4	354 (8.7)	22.0

Characteristics	Women		Men	
	Total, n (%)	Ever tested HIV (%)	Total, n (%)	Ever tested HIV (%)
Ever paid for sex				
No	12,861 (99.9)	10.8	3,911 (96.3)	19.6***
Yes	1 (0.01)	0.0	152 (3.7)	44.7
Knowledge for treatment for HIV	(n=10,348)		(n=3,965)	
No/Don't know	5,390 (52.1)	12.8	2,729 (68.8)	20.2
Yes	4,959 (47.9)	14.0	1,236 (31.2)	22.8
Age at first sexual intercourse	(n=10,157)		(n=3,083)	
<15 years	1161 (11.4)	8.2***	136 (4.4)	21.1
15-19 years	6574 (64.7)	11.6	1515 (49.1)	24.4
20-24 years	2052 (20.2)	19.5	1022 (33.1)	25.2
25 and above years	370 (3.7)	22.7	410 (13.3)	28.5
Mean (SD)	14.0 (7.7)		15.1(9.1)	
Number of lifetime sexual partners	(n=10, 207)		(n=3097)	
1	9,877 (96.8)	12.9	1,857 (60.0)	22.1**
2+	330 (3.2)	12.0	1,240 (40.0)	29.4
Mean (SD)	1.04 (0.46)		2.36 (4.83)	
*** p<0.001, ** p<0.01, * p<0.05 (chi-square test)				

Characteristics of women related to maternal, sexual violence and others

Around 7.8% of women aged 15-49 years ever experienced sexual violence. More than two-fifths of their partners achieved secondary education (44%) followed by primary (21.9%) and higher education (18.1%). Nearly 60% received all four focused ANC visits and 63.5% of them delivered their most recent baby in the health facility. (Table 2).

Table 2: Proportion of HIV testing by characteristics related to violence among women, pregnancy and delivery related services

Characteristics	Women	
	Total, n (%)	Ever tested HIV (%)
Ever experienced sexual violence	(n=4,421)	
Not experienced	4,075 (92.2)	11.9
Experienced	346 (7.8)	10.1
Received all 4 ANC	(n=3,762)	
Not received	1,550 (41.2)	11.2***
Received	2,212 (58.8)	28.0
Partner's education level	(n=9,852)	
No education	1,575 (16.0)	4.1***
Primary	2,158 (21.9)	7.8
Secondary	4,337 (44.0)	13.7
Higher	1,782 (18.1)	25.2
Place of recent delivery	(n=3,997)	

Characteristics	Women	
	Total, n (%)	Ever tested HIV (%)
Elsewhere	1,459 (36.5)	6.3***
Health facility	2,539 (63.5)	28.2

Factors associated with HIV testing among women and men

Table 3 presents the unadjusted and adjusted OR from the binary logistic regression analysis that illustrates the odds of women and men who had ever tested for HIV. An adjusted model was used to adjust the effects of independent characteristics. All the variables were used in the multivariable model but only the variable that turned significant in the adjusted analysis are presented in the table. The result with all the variables is provided in the supplementary table 2.

Women from Bagmati province (aOR=2.0; 95%CI =1.1-3.8), Lumbini province (aOR=2.3; 95% CI=1.1-4.8) and Sudurpaschim Province (aOR=3.3, 95% CI=1.5-7.0) were more likely to have tested for HIV compared to the women from province no 1. Women who had a media exposure at least once a week had 2.8 times (aOR=2.8; 95% CI= 1.4-5.3) higher odds of having HIV testing compared to those who hadn't been exposed to media at all. Those women who had their recent delivery at a health facility were more likely (aOR=3.9; 95% CI=2.4-6.3) to have HIV testing compared to those who had delivered their recent babies somewhere other than the health facility (Table 3).

Men aged 20 years and above were more likely to have HIV testing compared to those between age 15-19 years of age. Similarly, compared to no education, men with secondary and higher education were more likely to have HIV testing. Men from province no 2 (aOR=3.5; 95% CI=2.0-6.2) and Sudurpaschim province (aOR=1.6; 95% CI= 1.0-2.4) had higher odds of having HIV testing compared to the Province no 1. Men with richer (aOR=1.6; 95% CI=1.1-2.4) and richest (aOR=1.6; 95% CI=1.0-2.4) quintiles were also more likely to have HIV testing compared to the poorest quintile of wealth. Men who had comprehensive knowledge of HIV had higher odds (aOR=1.4; 95% CI=1.1-1.8) of having HIV testing compared to those who don't have a comprehensive knowledge. Similar to the women, men with media exposure at least once a week were more likely (aOR=1.7; 95% CI=1.0-3.1) to have HIV testing compared to those who hadn't been exposed to media at all. Further, men who ever paid for sex (aOR=2.1, 95% CI= 1.3-3.4) and had 2+ sexual partners (aOR=1.6; 95% CI=1.2-2.0) in their lifetime were more likely to have HIV testing compared to the men who hadn't paid for sex and had only one sex partner respectively (Table 3).

Table 3: Unadjusted and Adjusted Odds Ratio (OR) of HIV testing among women and men

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age				
15-19	ref.	ref.	ref.	ref.
20-24	4.0*** (3.1-5.2)	1.4 (0.6 - 3.2)	4.5***(3.0-6.7)	3.9*** (2.1 - 7.2)
25-29	5.6***(4.3-7.3)	1.7 (0.8 - 3.6)	8.2**(5.1-13.2)	6.4*** (3.3 - 12.1)

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
30-39	3.2*** (2.5-4.2)	1.9 (0.8 - 4.5)	7.6***(5.1-11.3)	5.5*** (3.0 - 10.2)
40-49	1.4 (0.9-1.9)	0.2 (0.01 - 1.9)	4.2***(2.6-6.6)	3.0*** (1.6 - 5.7)
Education				
No education	ref.	ref.	ref.	ref.
Primary	1.8***(1.4-2.3)	0.8 (0.4 - 1.6)	1.5 (0.9-2.3)	1.5 (0.9 - 2.3)
Secondary	2.3***(1.9-2.9)	1.4 (0.7 - 2.6)	1.9**(1.2-2.8)	2.3*** (1.4 - 3.6)
Higher	5.6***(4.4-7.0)	2.1 (0.9 - 4.2)	1.9**(1.2-2.9)	1.7* (1.0 - 2.8)
Province				
Province no 1	ref.	ref.	ref.	ref.
Province no 2	0.3(0.2-0.4)	0.8 (0.3 - 1.8)	2.6***(1.7-4.1)	3.5***(2.0 - 6.2)
Bagmati	1.5* (1.0-2.2)	2.0* (1.1 - 3.8)	1.3(0.9-2.0)	1.2 (0.8 - 1.8)
Gandaki	1.4(0.9-2.0)	1.4 (0.8 - 2.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.4)
Lumbini	1.7*(1.1-2.6)	2.3* (1.1 - 4.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.5)
Karnali	0.9 (0.6-1.4)	1.9 (0.9 - 4.0)	0.9(0.6-1.6)	1.1 (0.6 - 1.8)
Sudurpaschim	2.4*** (1.6-3.6)	3.3** (1.5 - 7.0)	1.7*(1.1-2.7)	1.6* (1.0 - 2.4)
Wealth quintile				
Poorest	ref.	ref.	ref.	ref.
Poorer	1.0 (0.7-1.3)	1.0 (0.6 - 1.7)	0.9 (0.7-1.3)	0.9 (0.6 - 1.3)
Middle	0.9 (0.7-1.3)	1.0 (0.5 - 1.9)	1.7** (1.2-2.5)	1.3 (0.9 - 2.0)
Richer	1.2 (0.9-1.7)	0.9 (0.5 - 1.6)	2.0***(1.4-2.9)	1.6* (1.1 - 2.4)
Richest	2.5***(1.8-3.4)	1.5 (0.7 - 3.1)	1.9***(1.3-2.8)	1.7* (1.1 - 2.6)
Comprehensive knowledge on HIV				
No	ref.	ref.	ref.	ref.
Yes	2.6***(2.2-2.9)	1.0 (0.7 - 1.5)	1.5***(1.2-1.8)	1.4* (1.1 - 1.8)
Any media exposure				
Not at all	ref.	ref.	ref.	ref.
At least once a week	3.1***(2.3-4.1)	2.8** (1.4 - 5.3)	2.4***(1.5-3.9)	1.7* (1.0 - 3.1)
Less than once a week	3.3***(2.5-4.3)	1.4 (0.7 - 2.6)	1.9**(1.2-3.0)	1.3 (0.8 - 2.3)
Ever paid for sex				
No	-	-	ref.	ref.
Yes	-	-	3.3***(2.1-5.2)	2.1** (1.3 - 3.4)
Number of lifetime sexual partners				
1	ref.	ref.	ref.	ref.
2+	0.9 (0.6-1.5)	0.9 (0.2 - 3.0)	1.5**(1.2-1.8)	1.6*** (1.2 - 2.0)
Place of recent delivery				
Elsewhere	ref.	ref.	-	-
Health facility	5.7***(4.9-6.5)	3.9*** (2.4 - 6.3)		
*** p<0.001, ** p<0.01, * p<0.05 (t-statistic)				

Discussion

More men than woman ever tested for HIV. The findings from this study are in contrast to the testing behavior in, Nairobi[13], where women were more likely to get tested than men. This could be explained partly by men's engagement in high risk behavior and high rate of seasonal migration among male in Nepal[14];high risk perception and better health seeking behavior and access to HTC services. The National HIV Strategic Plan 2016-21 identifies clients of FSWs, and migrants as high-risk populations and various HIV related programs are targeted at improving HIV testing behavior among migrants[4]. In the integrated bio-behavioral surveillance (IBBS) survey conducted among male labour migrants[15], reported practising high-risk sexual behaviour resulting in heightened risk among their spouses. Similarly, IBBS survey conducted among FSWs and MSM and Transgender people reported 50% of HIV testing coverage [10], Moreover, IBBS survey among labor migrant and their spouses depicts HTC service utilization of 18.6% and 35% respectively.[16,17]

One of the reasons for more women being tested for HIV in Nairobi is mainly due to the increased testing among women in PMTCT programs. In countries such as India[18] and Seirra Leone[19], HIV testing was found higher among women who had given birth in the last 5 years and majority of those women who reported testing as part of the ANC services. This reinforces the importance of ANC services for HIV testing among women of reproductive age. Despite the Government of Nepal strategy to expand HIV testing services as part of PMTCT services, not all women who received all 4 ANCs were tested for HIV.

Similarly, other critical area is the HIV services for those surviving sexual violence. Further, women experiencing sexual violence are also being missed from the recommended HIV counselling and testing services; only 10 percent of total women who reported experiencing sexual violence in the recent years had tested for HIV. It is unclear if they even received post exposure prophylaxis (PEP) services as per WHO recommendation[28]. Our findings suggest the need for additional efforts to promote HIV testing among women who experience sexual violence.

Consistent with the findings of Zambia,[20] our study showed health facility delivery is correlated with HIV testing. This provides an opportunity to scale up HIV testing among women as more women are now delivering at heath facility in recent years.[21] Special efforts needs to be designed to promote HIV testing as part of ANC and institutional delivery services. Further, expansion of HIV testing facilities is critical as only a quarter of government and 30% of private hospital currently provide HIV testing services [22]

Men who were in the age-group (20-24 years) were more likely to get tested. Some other studies also reported similar findings.[23,24] The potential reason for this age-group to be tested could also be tied with the prime age of migration.[11] Education was also found to be a determining factor for HIV testing, the most possible explanation could be higher understanding and awareness about the testing services and its benefits. Higher education was also a determining factor for utilization of HIV testing in different counties.[23–26] In addition to education, HIV related knowledge was the significant correlates of being tested for HIV among men. This is confirmed by studies conducted in Kenya [27], Canada [28], and sub-Saharan Africa.[29] As reported in various studies undertaken at the global and regional level[30–33], being in a higher economic quintile was associated with HIV testing. It is to be noted that HIV testing is free in Nepal but higher testing among participants at higher economic quintile may be related to the higher risk behavior and involvement in risky sex behavior among these groups.[11]

HIV testing services varied by provinces [22] which is explained by the disproportionate distribution of HIV in the country. Province no 2 is one of the most affected provinces as it borders India and is one of the provinces with migrants to India.[34] Lumbini Province and Sudurpaschim Province has the highest case finding rate (1.6% and 1.5% respectively).[35] Based on the HIV size estimation, Province no 2, Lumbini Province and Sudurpaschim Province have a higher number of migrants living with HIV.[36] Major occupation in the province is through labor migration to India. There is evidence of engagement of the migrant population in higher risky behaviors in India.[37] This could be linked with the variation of HIV testing among migrant populations in each province. Service availability and readiness is also a key indicator for the HIV testing among men and women. Authors report persistent gaps in staff, guidelines and medicine and commodities for HIV testing and treatment in Nepal which could also potentially impact the HIV service uptake[29]. Further comprehensive knowledge on HIV and media exposure were among the determinants for HIV testing, thus, indicating the need to continue or upscale such program.

The HIV estimates in 2019 shows that there are 29,503 PLHIV in the country, however about only two-thirds are currently on ART which falls short of the UNAIDS goal of 90-90-90 by 2020.[38] It is evident that even the high risk groups (those having paid sex or those reporting recent sexual behavior with person other than their spouse or regular partner) are not receiving HIV testing services.[39]

These findings clearly indicate the need to reach populations in lower economic quintile and illiterate populations as they were less likely to get tested. Considering the KPs such as FSWs or migrants; nearly one-fourth (37%) were illiterate or had no formal schooling.[40] HIV testing coverage can be improved with the innovative and targeted approaches including engagement of community-lay providers as well as targeting the sexual, injecting or social network partners of PLHIV.[38]

Our study utilized the most recent nationally representative data and assessed gender disaggregated HTC service uptake and correlates among general population. Our study has some limitations. This analysis used the data from cross sectional study so that the causal association could not be established. Behavioral desirability bias might have some effect on under reporting of sexual behaviors. The analysis was limited to the available variables included in the NDHS.

Conclusion:

HIV testing is not widespread and more men than women are accessing HIV services. More than two-thirds of women who delivered at health facilities never tested for HIV. HTC services are a critical service for women experiencing sexual violence. However, only 1 in 10 women experiencing sexual based violence received HIV testing. Media exposure and comprehensive knowledge on HIV are critical determinants for HIV testing, therefore, the National HIV program should focus on strengthening social behavior change communication interventions, strengthening PMTCT program. It is imperative to reach out to people engaging in risky sex behavior, people with lower educational attainment and those in the lower wealth quintile for achieving 95-95-95 targets by 2030 as a part of SDGs.

Data availability statement
Data are available in a public, open access repository. The datasets generated during the current study are available from within the Demographic and Health Survey Program repository (https://dhsprogram.com/data/ available-datasets.cfm).

Abbreviations

ANC: Ante-Natal Care
aOR: Adjusted Odds Ratio
ART: Anti-Retroviral Therapy
CI: Confidence Interval
DHS: Demographic and Health Survey
FSW: Female Sex Workers
HIV: Human Immunodeficiency Virus
HTC: HIV Testing and Counselling
MSM: Men who have Sex with Men
MSWs: Male Sex Workers
NGOs: Non-Governmental Organization
MoHP: Ministry of Health and Population
NDHS: Nepal Demographic and Health Surveys
PLHIV: People Living with HIV
PMTCT: Prevention of Mother to Child Transmission
PWID: People Who Inject Drugs
SD: Standard Deviation
SE: Standard Error
WHO: World Health Organization

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Contributions
NB and KB involved in the design and conception of the study. KA and NB involved in the analysis and interpretation of the findings; KA, NB, RT and KB involved in the write up of the manuscript. BS supervised, reviewed and edited the manuscript. All authors read and approved the final manuscript.

Ethical approval

NDHS 2016 was reviewed and approved by the institutional review board Nepal Health Research Council and the institutional review board of ICF Macro International. Written consent was obtained from all the participants before interviewing during the survey. We used de-identified data publicly available from the DHS website (http://www.dhsprogram.com/data/available-datasets.cfm), and thus

did not require ethical approval for this study. Permission was obtained from the DHS program to use the data for further analysis.

Consent for publication
Not applicable.

Competing interests
All authors declare that they have no competing interest in the final content of the study.

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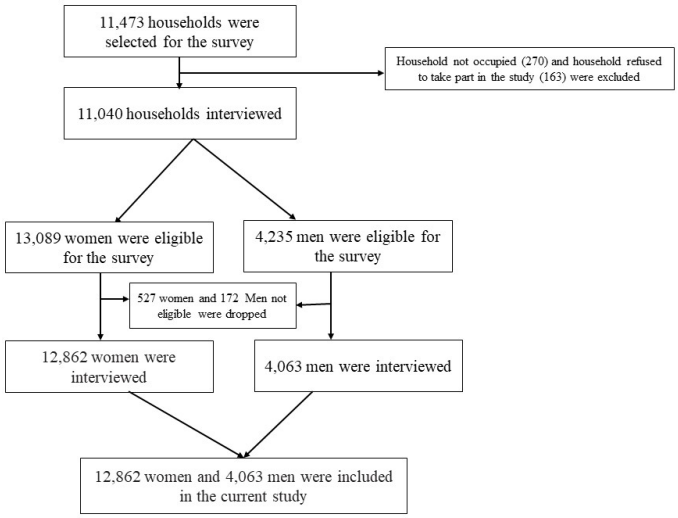

Fig 1:Flow chart showing the sampling of study

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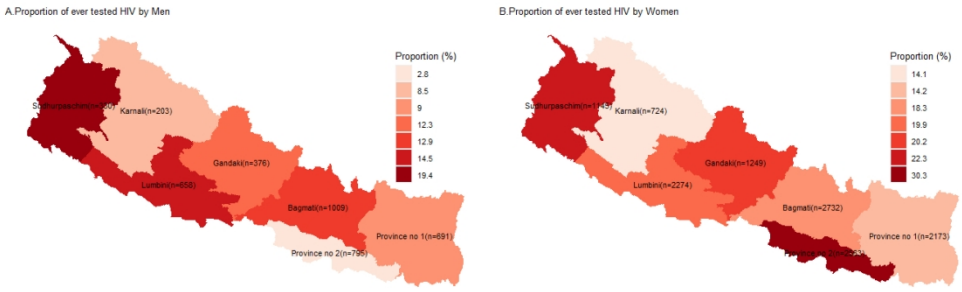

Fig 2: Proportion of ever tested HIV by Men (A), by Women (B)

913x471mm (38 x 38 DPI)

Factors Associated with HIV Testing and Counselling Services among Women and Men in Nepal: A Cross-sectional Study Using Data from a Nationally Representative Survey

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Supplementary Table 1: List of variables and their operational definitions

Independent Variables	Definitions	Categories
Age (years)	Completed age of the women and men at the time of data collection	1) 15-19 2) 20-24 3) 25-29 4) 30-39 5) 40-49
Ethnicity	Ethnic categories are that an individual's falls in the Nepalese context	1) Hill Brahamin/Chettri 2) Terai Caste 3) Janajatis 4) Dalit/Muslims/Others
Education	Level of education classified as per the years of schooling/grades	1) No education 2) Primary (basic education with incomplete secondary education) 3) Secondary education (completed secondary education) 4) Higher education (higher than secondary)
Place of residence	Residence areas of respondents	1) Urban 2) Rural

Province	Administrative unit.	1) Province no. 1 2) Province no. 2 3) Bagmati Province 4) Gandaki Province 5) Province 5 6) Karnali Province 7) Sudhurpaschim Province
Wealth quintile	Composite measure of a household's cumulative living standard, calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities.The wealth index score of each item is divided into quintile.	1) Poorest 2) Poorer 3) Middle 4) Richer 5) Richest
Marital status	Current marital status of the respondents (women and men).	1) Never married 2) Married/living together 3) Divorced/separated/widowed
Occupation	Women and men employed in the 12 months preceding the survey by occupation.	1) Didn't work 2) Agricultural 3) Professional/clerical 4) Manual labor
Comprehensive knowledge on HIV	Comprehensive knowledge means knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chance of getting HIV, knowing that a healthy-looking person can have HIV, and rejecting the two most common local misconceptions about transmission or prevention of HIV.	1) No 2) Yes
HIV discriminatory behaviour	HIV discriminatory behavior was asked among the respondents who have heard of HIV or AIDS and discriminatory attitude means those who do not think that children living with HIV should be able to attend	1) No 2) Yes

	school with children who are HIV negative or would not buy fresh vegetables from a shopkeeper who has HIV.	
Media exposure	Media exposure means reading a newspaper, watching television and listening to the radio.	1) Not at all 2) At Least once a week 3) Less than once a week
Recent sexual activity	Women and men had sexual intercourse with a person that is not their spouse and does not live with them in the past 12 months.	1) No 2) Yes
Ever paid for sex	Those who ever paid anyone in exchange for having sexual intercourse.	1) No 2) Yes
Knowledge for treatment for HIV	Knowledge for treatment for HIV was asked among the respondents who have heard of HIV or AIDS. This is the knowledge regarding the availability of HIV treatment.	1) No 2) Yes
Age at first sexual intercourse (years)	Age of woman or man in completed years when they had first sex.	1) <15 2) 15-19 3) 20-24 4) 25 and above
Number of lifetime sexual partners	Women and men aged 15-49, who had two or more sexual partners in their lifetime.	1) 1 2) 2+
Ever experienced sexual violence	Sexual violence is defined as those women who have experienced any sexual violence (committed by a husband or anyone else) ever before the survey. Sexual violence questions were asked to the women age 15-49 from the selected households and who were chosen for administering domestic violence module.	1) Not experienced 2) Experienced
Received all 4 ANC	Women received ANC at 4, 6, 8, and 9 months and it is based on the number of women with ANC for	1) Not received 2) Received

	their most recent birth 5 years preceding the survey.	
Women's partners' education	Level of education of women's husband classified as per the years of schooling/grades.	1) No education 2) Primary (basic education with incomplete secondary education) 3) Secondary education (completed secondary education) 4) Higher education (higher than secondary)
Place of recent delivery	Women who had delivered in the 5 years preceding the survey.	1) Elsewhere 2) Health facility

Supplementary table 2: Unadjusted and Adjusted Odds Ratio (OR) of HIV testing among women and men

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age				
15-19	ref.	ref.	ref.	ref.
20-24	4.0*** (3.1-5.2)	1.4 (0.6 - 3.2)	4.5***(3.0-6.7)	3.9*** (2.1 - 7.2)
25-29	5.6***(4.3-7.3)	1.7 (0.8 - 3.6)	8.2**(5.1-13.2)	6.4*** (3.3 - 12.1)
30-39	3.2*** (2.5-4.2)	1.9 (0.8 - 4.5)	7.6***(5.1-11.3)	5.5*** (3.0 - 10.2)
40-49	1.4 (0.9-1.9)	0.2 (0.01 - 1.9)	4.2***(2.6-6.6)	3.0*** (1.6 - 5.7)
Ethnicity				
Hill Brahmin/Chhetri	ref.	ref.	ref.	ref.
Terai caste	0.2***(0.2-0.3)	0.6 (0.3 - 1.2)	1.3(0.9-1.8)	0.7 (0.4 - 1.1)
Janajatis	0.6*** (0.5-0.8)	1.1 (0.7 - 1.8)	0.9(0.7-1.1)	0.9 (0.7 - 1.2)
Dalit/Muslim/Other	0.4***(0.3-0.6)	1.4 (0.8 - 2.4)	1.0(0.7-1.5)	1.0 (0.6 - 1.6)
Education				
No education	ref.	ref.	ref.	ref.
Primary	1.8***(1.4-2.3)	0.8 (0.4 - 1.6)	1.5 (0.9-2.3)	1.5 (0.9 - 2.3)
Secondary	2.3***(1.9-2.9)	1.4 (0.7 - 2.6)	1.9**(1.2-2.8)	2.3*** (1.4 - 3.6)
Higher	5.6***(4.4-7.0)	2.1 (0.9 - 4.2)	1.9**(1.2-2.9)	1.7* (1.0 - 2.8)
Place of residence				
Urban	ref.	ref.	ref.	ref.
Rural	0.6**(o.5-0.8)	1.1 (0.8 - 1.7)	0.9 (0.7-1.3)	1.1 (0.8 - 1.5)
Province				
Province no 1	ref.	ref.	ref.	ref.
Province no 2	0.3(0.2-0.4)	0.8 (0.3 - 1.8)	2.6***(1.7-4.1)	3.5***(2.0 - 6.2)

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Bagmati	1.5* (1.0-2.2)	2.0* (1.1 - 3.8)	1.3(0.9-2.0)	1.2 (0.8 - 1.8)
Gandaki	1.4(0.9-2.0)	1.4 (0.8 - 2.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.4)
Lumbini	1.7*(1.1-2.6)	2.3* (1.1 - 4.8)	1.5(0.9-2.4)	1.5 (0.9 - 2.5)
Karnali	0.9 (0.6-1.4)	1.9 (0.9 - 4.0)	0.9(0.6-1.6)	1.1 (0.6 - 1.8)
Sudurpaschim	2.4*** (1.6-3.6)	3.3** (1.5 - 7.0)	1.7*(1.1-2.7)	1.6* (1.0 - 2.4)
Wealth quintile				
Poorest	ref.	ref.	ref.	ref.
Poorer	1.0 (0.7-1.3)	1.0 (0.6 - 1.7)	0.9 (0.7-1.3)	0.9 (0.6 - 1.3)
Middle	0.9 (0.7-1.3)	1.0 (0.5 - 1.9)	1.7** (1.2-2.5)	1.3 (0.9 - 2.0)
Richer	1.2 (0.9-1.7)	0.9 (0.5 - 1.6)	2.0***(1.4-2.9)	1.6* (1.1 - 2.4)
Richest	2.5***(1.8-3.4)	1.5 (0.7 - 3.1)	1.9***(1.3-2.8)	1.7* (1.1 - 2.6)
Occupation				
Did not work	ref.	ref.	ref.	ref.
Agricultural	0.8*(0.6-0.9)	0.7 (0.4 - 1.1)	1.6*(1.1-2.4)	0.8 (0.4 - 1.3)
Professional/clerical	2.4***(1.9-3.1)	1.2 (0.6 - 2.3)	2.2***(1.5-3.4)	0.7 (0.4 - 1.2)
Manual labor	1.4**(1.1-1.7)	0.6 (0.3 - 1.1)	2.2***(1.6-3.2)	0.7 (0.4 - 1.2)
Comprehensive knowledge on HIV				
No	ref.	ref.	ref.	ref.
Yes	2.6***(2.2-2.9)	1.0 (0.7 - 1.5)	1.5***(1.2-1.8)	1.4* (1.1 - 1.8)
HIV discriminatory behavior				
No	ref.	ref.	ref.	ref.
Yes	0.5***(0.4-0.6)	0.7 (0.5 - 1.0)	0.9 (0.8-1.1)	1.2 (0.9 - 1.6)
Any media exposure				
Not at all	ref.	ref.	ref.	ref.
At least once a week	3.1***(2.3-4.1)	2.8** (1.4 - 5.3)	2.4***(1.5-3.9)	1.7* (1.0 - 3.1)
Less than once a week	3.3***(2.5-4.3)	1.4 (0.7 - 2.6)	1.9**(1.2-3.0)	1.3 (0.8 - 2.3)
Recent risky sexual activity				
No	-	-	ref.	ref.
Yes	-	-	1.1 (0.7-1.6)	0.8 (0.5 - 1.2)
Ever paid for sex				
No	-	-	ref.	ref.
Yes	-	-	3.3***(2.1-5.2)	2.1** (1.3 - 3.4)
Knowledge for treatment for HIV				
No	ref.	ref.	ref.	ref.
Yes	1.1(0.9-1.3)	1.1 (0.8 - 1.6)	1.2 (0.9-1.4)	1.2 (0.9 - 1.5)
Age at first sexual intercourse				
>15 years	ref.	ref.	ref.	ref.

Characteristics	Women		Men	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
15-19 years	1.4**(1.1-1.8)	1.2 (0.6 - 2.3)	1.2 (0.8-1.9)	1.3 (0.8 - 2.1)
20-24 years	2.7***(2.1-3.5)	0.7 (0.3 - 1.5)	1.3 (0.8-2.0)	1.1 (0.7 - 2.0)
25 and above years	3.3***(2.2-4.9)	1.3 (0.5 - 3.5)	1.5 (0.8-2.6)	1.6 (0.9 - 2.8)
Number of lifetime sexual partners				
1	ref.	ref.	ref.	ref.
2+	0.9 (0.6-1.5)	0.9 (0.2 - 3.0)	1.5**(1.2-1.8)	1.6*** (1.2 - 2.0)
Ever experienced sexual violence				
Not experienced	ref.	ref.	-	-
Experienced	0.8 (0.6-1.2)	1.8 (0.9 - 3.3)	-	-
Received all 4 ANC				
Not received	ref.	ref.	-	-
Received	3.1***(2.4-3.9)	1.2 (0.8 - 1.8)	-	-
Partner's education level				
No education	ref.	ref.	-	-
Primary	1.9***(1.4-2.7)	1.6 (0.6 - 3.7)	-	-
Secondary	3.7***(2.8-5.0)	1.8 (0.7 - 4.5)	-	-
Higher	7.9***(5.8-10.8)	2.0 (0.8 - 5.4)	-	-
Place of recent delivery				
Elsewhere	ref.	ref.	-	-
Health facility	5.7***(4.9-6.5)	3.9*** (2.4 - 6.3)		
*** p<0.001, ** p<0.01, * p<0.05 (t-statistic)				

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any pre specified hypotheses	2-3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Bias	9	Describe any efforts to address potential sources of bias	3
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4
		(*b*) Describe any methods used to examine subgroups and interactions	4
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	4
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Not applicable
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	5-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11
		(*b*) Report category boundaries when continuous variables were categorized	5-11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.