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KEYWORDS: Precancerous cervical lesion, Human immune deficiency virus, cancer, Visual inspection with acetic acid.

PRECANCEROUS CERVICAL LESIONS AMONG HIV INFECTED WOMEN IN REFERRAL HOSPITALS OF AMHARA REGION, NORTHWEST ETHIOPIA

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ABSTRACT:

Background: Cancer of the cervix is a major public health problems facing women in Ethiopia. Its magnitude is higher in HIV infected women than non HIV infected women. Thus, screening targeting HIV infected women is being undertaken in low and middle income countries, including Ethiopia. However, its magnitude and determinants among women living with human immune deficiency syndrome in Amhara region is lacking. Therefore, this study aimed to assess the magnitude of and factors associated with precancerous cervical lesion.

Methods: An institution based cross-sectional study was conducted from 1st September to 30th December 2015. Four hundred and thirty-five systematically selected women were included in the study. The data were collected by using a pre-tested and structured questionnaire. Data was collected through face to face interview and patient chart review. Visual inspection with acetic acid was applied for screening and treatment. Data were entered into Epi-info version 7, cleaned and analysed using SPSS version 20. Logistic regression analysis was fited and odds ratio with 95% confidence interval were computed.

Results: This study revealed that the overall prevalence of precancerous cervical lesions was 20.2% (95% CI: 13%, 29%). Having more than one lifetime sexual partner (AOR=2.91, 95% CI: 1.13, 7.52), history of sexually transmitted disease (AOR=4.04, 95% CI: 2.19, 7.44), age at first birth less than 18 years (AOR=3.36, 95% CI: 1.79, 5.01) and baseline CD4 count less than 200 cells/mm3 (AOR=7.51, 95% CI: 3.58, 15.68) were factors associated with precancerous cervical lesion.

Conclusions: This study revealed that the prevalence of precancerous cervical lesions in Amhara region is found to be high. Interventions to create a screening strategy for cervical intraepithelial neoplasia for all women living with HIV and family planning promotion to delay age for first birth should be undertaken. In addition, awareness creation about impact of multiple sexual partner, promotion of early HIV diagnosis and timely base line CD 4 cell count testing, and organize community based campaign to stem the continuinig rise of STI in HIV positive women are important.

Background

Invasive cervical cancer (ICC) is defined as a cancer that has spread from the surface of the cervix to tissue deeper in the cervix or to other parts of the body [1]. It is the third most common cancer in women worldwide[2]. Though it is a preventable disease, it remains a leading cause of death among women in resource limited countries [3]. Globally, it has a yearly incidence rate of 371,000 cases and an annual death rate of 190,000 with 80% of the cervical cancer mortalities happening in resource limited countries. The highest rates are found in Central and South America, East Africa, South and South-East Asia and the Western Pacific [4]. But, the problem is predominantly severe in sub- Saharan Africa, where the age standardized incidence rate is 45 per 100,000 women [5].

In addition, the age-adjusted incidence rate of cervical cancer in Ethiopia is 35.9 per 100,000 women [6]. In spite of this fact, very few women get screening services [7]. Even though there is no national cancer registry, reports from retrospective reviews of biopsy results have revealed that cervical cancer, followed by breast cancer, is the most prevalent cancer among women in the country [8].

Since the onset of the Human Immunodeficiency Virus (HIV) epidemic, cervical cancer was classified as an Acquired Immunodeficiency syndrome (AIDS) defining cancer because of its close association with HIV infection [9]. Studies have shown that the prevalence of cytologically noticed squamous intraepithelial lesion (SIL) and infection of the cervix with human papillomavirus (HPV) are suggestively more common in HIV-infected than non HIV-infected women [10-12]. Furthermore, unlike other AIDS-defining cancers, the incidence of cervical cancer has not decreased significantly with the increasing use of antiretroviral therapy [13, 14]. Hence, the development of a rational approach to the screening and the subsequent management of cervical disease in this segment of population are important.

According to the population-based surveys, in developing countries 63% of women are screened for cervical cancer, typically by Papanicolaou smears and more recently HPV test, compared with 19% in low and middle income countries [15, 16]. The cytology based cervical screening has restricted the incidence of cervical cancer for decades [17]. Previous practices in many sub-Saharan countries underlined a lack of reliability of cytology based cervical screening at the population level due to limited access to health services and no screening programs, limited or non-existent awareness among populations and health workers, limited or no access to diagnostics and laboratories, poor referral and follow-up, lack of the essential resources, infrastructure and technological expertise, together with the need for repeated screening at regular intervals [18, 19]. Hence, the impacts are directly visible on the poors, education, and gender equity which are the first, fourth and the fifth sustainable development goals (SDGs) [20].

The development of a rapid and affordable test for HPV, known identified causes of cervical cancer [1, 21], makes a viable alternative

to cytologic screening [22, 23]. Currently, the two assays most widely used for the detection of genital types are polymerase chain reaction (PCR) with generic primers and the Hybrid Capture 2 (hc2) assay. Both of them are expensive, time-consuming, requires sophisticated laboratory infrastructure and essentially a research tool, not suited to be applied as a mass screening test particularly in resource limited settings. However, the new rapid test, which is a modification of the hc2 test requires only basic laboratory tools, can be set up easily in the field and can be easily taught to health workers. This test has shown good concordance with the previous test and has the maximum potential to be applied as a population screening tool and has been used for screening both in high income countries and in resource-limited settings alone or in combination with other methods [24]. However, such kind of screening method is nonexistent in Ethiopia.

Therefore, low cost cervical cancer screening procedures based on Visual Inspection of the cervix with Acetic acid (VIA) or Visual Inspection with Lugol's Iodine (VILI) have been proposed and adapted to resource-limited settings for years [25, 26]. Although VIA has lower sensitivity and specificity than HPV tests, it has shown an equal validity compared to cytology in resource limited settings[27, 28]. VIA is reported to have 80% sensitivity, 92% specificity, a 10% positive predictive value and a 99% negative predictive value [29]. In some resource -limited countries, including Ethiopia, donor funding from the President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund has provided the resources and infrastructure for VIA screening and treatment of HIV- infected women and is being implemented since the past few years [30].

It is known that HIV infection and cervical cancer are major public health problems facing women in Ethiopia. More than half a million women aged 15 or older are estimated to be infected with HIV and at risk of developing cervical cancer in Ethiopia [31]. Though screening of precancerous cervical lesion (PCL) for HIV-infected women has been started in limited centers in Ethiopia, data on the prevalence and factors associated with the lesion are limited. Knowledge about prevalence and associated factors is required to identify HIV infected women who are more likely to develop precancerous cervical lesion and to plan appropriate screening and treatment strategies. The current study provides health planners and policymakers with useful information that could lead to prevention of cervical cancer mortality and morbidity in HIV infected women.

Methods and materials

Setting

A hospital based cross sectional study was conducted in three referral hospitals of Amhara regional state from 1st September to 30th December 2015. Amhara regional state is one of the nine states in Ethiopia, on the northwestern part of Ethiopia. The region is bordered by Tigray region to the north, Sudan to the west, the Afar region to the east, and the Benishangul-Gumuz to the west and southwest, Oromia region to the south. According to the 2016 Ethiopian Demographic and health survey report, the prevalence of HIV in the region was 2.1%. The three referral hospitals (Debre markos, Dessie and Felegehiwot) were included in the stud as the were the only screening and treatment centers for precancerous cervical lesions for PCL in HIV infeted women in the region. Each hospital provides care and treatment for more than 3,000 HIV-infected patients. Each referral hospital has receives an average of 80 HIV infected women per day [32].

Participants

Those HIV positive women who were visiting the ART clinic at one of the three hospitals and those HIV positive women who were screened for precancerous cervical lesion (PCL) were recruited. Women who were seriously ill and unable to hear were excluded from the study. additionally, HIV infected women who had a history of diagnosed cervical cancer and those who had total hiserectomy were excluded from the study.

Sampling technique and procedure

A sample size of 435 was determined using single population proportion formula. n = Z2 P (1 – P)/d2 with the following assumptions: Prevalence (P) of 22.1% precancerous cervical lesions among HIV-infected women in Southern Ethiopia [33], a confidence interval (CI) of 95%, and marginal error (d), 4% and 5% non-response rate.

Since there are only three hospitals that provides this service, all of them were selected purposively. Systematic sampling technique was employed to select each participant. Skip interval took from previous quarter (four month) report clients screened and treated in Felege Hiwot, Dessie and Debremarkose referral hospitals. The average skips interval was every 2nd client. The first participant was selected using simple random sampling by lottery method, which was one. The number of participants was proportionally allocated for each hospital.

Variables of the study

The dependent variable was precancerous cervical lesion, and the independent variables were sociodemographic characteristics, reproductive characteristics, and immunological status and behaviour characteristics.

Operational Definitions

Negative screening test of precancerous cervical lesion: No Aceto white lesions on VIA which is normal cervix that remained pale and pink in colour.

Positive screening test of precancerous cervical lesion: Sharp, distinct, well-defined, dense Aceto white areas close to the squamocolumnar junction on VIA.

Suspicion for precancerous cervical lesion: Any cervical ulcer or growth being observed.

Data Collection

Data were collected using structured and pretested questionnaire through face to face interviewer. Patients, ART follow up cahrts were also reviewd. Four trained female BSc midwife nurses supervised by two MSc midwives and the principal investigator collected the data during the study period.

The questionnaire was translated into local language, Amharic, by experts in both languages and was translated back to English to ensure consistency and accuracy. The data collection process was closely. The data collectors and supervisors were recruited based on previous experience of data collection and fluency in the local language. In addition, training was given for two consecutive days on how to interview, handling ethical issues and maintaining confidentiality and privacy. The pretest covered 14 reproductive age group women living in Gondar town, two weeks before the commencement of data collection. In addition, clients ART follows up charts were reviewed. The questionnaires were adapted from different studies considering the local situation of the study area and purpose of the study. Pretest was conducted to familiarize enumerators with the administration of the interview process and for ensuring consistency of responses. Debriefing sessions were held with the pretest field staff and the questionnaire was modified based on the lessons learned. Completed questionnaires were checked daily for inconsistencies and completeness.

Trained midwife nurses working in the screening and treatment centres of the three hospitals conducted the screening for this study. Bivalve speculum would be inserted into the vagina and the cervix visualized using a halogen focus lamp to identify the squamo-columnar junction (SCJ). After cleaning away any excess mucus using a cotton swab, a five percent acetic acid solution was applied to the cervix for VIA. The findings were visible one minute after application. Precancerous cervical lesions were included while dense aceto-white lesions with well-defined margins observed within the vicinity of the transformation zone originating from the

squamo-columnar junction, or if the whole cervix or cervical growth turned white. A suspicion of invasive cervical cancer was defined as any cervical ulcer or growth being observed. Results of VIA were classified as negative, positive, or suspicious for invasive cervical cancer (ICC) according to the International Agency for Research on Cancer (IARC) training manual. Whenever there was the uncertainty of the screening result, the midwife nurses were consulted a trained gynaecologist and he/she would confirm the diagnosis.

Data Processing and Analysis

Collected data was first checked manually for completeness and then coded, entered and cleaned by EPI-Info 3.5.3 statistical software. Then the data were exported to SPSS windows version 20 for data checking, cleaning and logistic regression. Bivariate analysis between dependent and independent variables was performed using binary logistic regression. $P \leq 0.2$ was used as criteria to select candidate variables for multivariate analysis. Multivariable logistic regression analysis was done to adjust for possible confounding variables. P-value < 0.05 with 95 % confidence interval (CI) for OR (odds ratio) was used in judging the significance of the associations.

Ethical consideration

Ethical clearance and approval was obtained from the Institutional Review Board (IRB) of the Institute of Public Health, University of Gondar. In addition, the official letter of cooperation granted by each hospital principal. The purpose of the study was explained to the study participants, informed written consent was secured and confidentiality of the information was censured. Participation was on a voluntary basis after informed consent, and responses were kept confidential. The consent procedure was approved by the ethics committee for all. The interview was undertaken privately in separate area. Women with positive results of VIA would be treated immediately following the screening while suspicious invasive cervical cancer findings would be sent to the gynecology clinic for bunch biopsy.

Results

Sociodemographic characteristics

A total 435 women from three referral hospitals were included in the study making a response rate of 100%. The mean age of the study participants was 35.9 years (SD = 4.5). More than half (53.6%) of the study participants were between 30 to 39 years old. Three hundred and fifty (80.5%) of the respondents were identified their religion as Orthodox Christians and majority (97.2%) were Amhara in Ethnicity. Three hundred seventy (85.1%) of them were urban dwellers and 175 (40.1%) had no formal education. More than half (56.1%) of the study participants were married and nearly a quarter of them (31%) were housewives. Two hundred seventy-eight (63.9%) of the women had monthly income of less than 33 Dollar per month per household with the median income of 28 Dollar (Table 1).

Reproductive health characteristics

The mean ages of menarche of the study participants was 14.62 (SD = 2.5) years. While the mean age of first sexual intercourse was 16.77 (SD = 2.7) years. Similarly, the mean age at first marriage was 16.18 (SD = 3.81) years and mean age at first birth was 16.77 (SD = 8.24) years. Three hundred five (71.3%) of the participants had their first sexual intercourse before the age of 18 years. More than half (51.3%) of the study participants had their first birth before the age of 18 years. Two hundred fifty-five (58.60%) study participants had more than one lifetime sexual partners and more than three-fourth (87.1%) of the participants had given birth at least once with the mean birth of 2.4 (SD = 2).

Neary one-third (30.1%) of the participants had a history of abortion and 147 (33.8%) participants used contraceptive during the study period. Of the contraceptive mthods, 84 (19.3%) used injectable contraceptive. One hundred eighty-nine (43.4%) used condom always and consistently during sexual intercourse. Nearly one-fourth (23%) of the study participants had history of sexually transmitted disease (STD) and 47 (11.3%) of them had history of ulcerative genital lesion (Table 2).

Immunology, behavioural and other characteristics

Nearly all the study participants (96.6%) are currently on highly active antiretroviral therapy (HAART). More than half 253 (58.3%) of the study participants had a baseline CD4 count of less than 200 copies/mm3 with the mean of 212 copies/mm3 (SD = 133.6). Most women (91.9%) had current CD4 counts of 200 copies/mm3 and above with the mean of 479 copies/mm3 (SD = 203.9). The median duration of HAART use was 36 months and 11(2.5%) participants had ever history of cigarette smoking (Table 3).

Prevalence of precancerous cervical lesion of the cervix

Out of 435 screened HIV infected women, 88 (20.2%) (95% CI: 13%, 29%) were found to be positive for pre-cancerous cervical lesion.

Factors associated with precancerous cervical lesion of the cervix

Results of binary logistic regression showed that age, occupational status, educational status, age at first birth, history of STD, lifetime number of sexual partners, and baseline CD4 count were identified as significant predictors of precancerous cervical lesion.

In multivariable logistic regression four variables i.e age at first birth, number of life time sexual partner, history of STD, and base line CD 4 count were associated with precancerous cervical lesion.

This study found that those mothers whose age at first birth less than 18 years were 3.36 times more likely to develop precancerous cervical lesion than those whose age at first birth more than 18 years [AOR = 3.36, 95% CI: 1.79, 6.32]. Those HIV infected women who had more than one lifetime sexual partner were 2.91 times more likely to develop precancerous cervical lesion than those having one lifetime sexual partner [AOR = 2.91, 95%CI: 1.13,7.52].

In addition, those women who ever had a history of STD were about 4.04 times more likely to have a precancerous cervical lesion than those without a history of STD [AOR = 4.04, 95% CI: 2.19, 7.44]. In this study those women whose baseline CD4 count were less than 200 cells/mm3 were 7.51 times more likely to have precancerous cervical lesions than those patients with a baseline CD4 count above 200cells/mm3 [AOR = 7.51, 95% CI 3.58,15.68] (Table 4).

Discussion

The present study revealed that the overall prevalence of precancerous cervical lesion among HIV-infected women in Amhara regional state referral hospitals was found to be 20.2%. This finding is in line with studies conducted in Ukraine (21%) , India (27.7%) , Southern Ethiopia (22.1%) and Kenya (26.4%) . However, the finding of this study was higher than the studies conducted in Republic of Cote Divoire (10.6%) and west Nigeria (14.3%) . This might be due to the fact that there are differences in the sexual practices of the women studied. Having multiple sexual partners because of cultural differences increases the risk of acquiring HPV, and in turn, the development of cervical pre-cancer and cancer. In Nigeria, where the lowest prevalence was reported, 96% of the study participants had two or less lifetime sexual partners. Whereas, in the present study, the mean number of lifetime sexual partners is more than three. Another possible reason for the high prevalence in this study might be due to the fact that there is a high chance of younger age at first sexual intercourse. The mean age of first sexual intercourse of this study participants was 16.7 years, which could increase the number of life time sexual partner and risk of exposure for precancerous cervical lesion.

In this study, factors associated with presence of precancerous cervical lesion were age at first birth, history of multiple sexual partner, baseline CD4 count of less than 200cells/mm3 and lifetime history of sexually transmitted disease.

The present study revealed that those mothers whose age at first

birth less than 18 years were 3.36 times more likely to develop precancerous cervical lesion as compared to those whose age at first birth more than 18 years [AOR=3.36, 95% CI: 1.79,6.32]. As far as the researchers' knowledge is concerned, this is the first report of any evidence that age at first birth less than 18 years might contribute to the risk of precancerous cervical lesion in HIV infected women. Those women who gave birth less than 18 years would be at high exposure to HPV through early sexual intercourse and multiple sexual partners.

The present study also found that those HIV infected women who had more than one lifetime sexual partner were 2.91 times more likely to develop precancerous cervical lesion than those having one lifetime sexual partner [AOR=2.91, 95% CI: 1.13,7.52]. The finding is consistent with previous studies conducted in Nigeria , southern Ethiopia and Mekelle . The possible explanations might be those women who had more than one lifetime sexual partner could develop precancerous cervical lesion because of as the number of sexual partners increases they become more prone to acquiring the HPV infection, which is the causative agent for cervical cancer .

In addition, this study indicated that those women who had ever history of STD were about 4.04 times more likely to have precancerous cervical cancer lesion than those without history of STD [AOR= 4.04, 95% CI: 2.19, 7.44]. This finding is consistent with studies done in Kenya and southern Ethiopia . The possible explanations might be due to the sexually transmitted nature of HPV infection. Co-infection with a STI like chlamydia trachomatis, herpes simplex or genital warts in the presence of HPV increased the risk of CIN by causing inflammation which facilitates HPV persistence and hence cervical lesion and carcinogenesis .

Finally, the present study found that participants whose baseline CD4 count less than 200 cells/mm3 were 7.51 times more likely to have precancerous cervical lesion than those whose baseline CD4 count was more than 200 cells/mm3 [AOR=7.51, 95% CI 3.58,15.68]. This finding is consistent with studies done in Tanzania and Mekelle . The possible explanations might be due to the effect of immune function, HIV induced immunosuppression leads to inability to control the HPV expression, hence the persistence of HPV infection and the development of cervical lesions.

This study didn't show any association between PCL and currently not on HAART among HIV-infected women. But studies conducted in Kenya and southern Ethiopia declared the association between precancerous cervical lesion and not on HAART among HIV-infected women. The possible explanation might be in southern Ethiopia 32% of the study participants did not start HAART but in this study majority of the study participant (97%) started HAART. Therefore, in this study HAART might have prevented the development of precancerous and invasive cancer and caused regression of the lesion.

However, this study has some inherent limitations. The first one was those mothers asked about the number of sexual partners might have a chance of social desirability bias. The second was the study included only HIV infected women voluntarly screened for PCL so that the generalizability of findings to all HIV infected women in Amhara region might be limited. Moreover, the subjectivity of the visual screening methods could affect the stud,s findings in an direction.

Conclusions

The present study finding showed that the prevalence of precancerous cervical lesion among HIV infected women in Amhara regional state referral hospitals is higher similar to the situation in the southern parts of Ethiopia. Age at first birth less 18 years, history of lifetime STD, having more than one lifetime sexual partners and baseline CD4 count of less than 200 cell/mm3 were factors that were significantly associated with precancerous cervical lesion. Therefore, scaling up the limited screening and treatment center is required to increase access of all HIV infected women to the service. Awareness creation on the availability of screening and tratment service is also important so that HIVinfected women could use the service. Besides, Measures aimed at preventing the acqusition and transmission of sexully transmitted disease and reducing the number of sexual partners are required. Early initiation of antiretroviral tratment and awarness creation of the impact of first birth at the age of less than 18 years are also important.

List of Abbreviations

AIDS: Acquired Immune Deficiency Syndrome, AOR: Adjusted Odds Ratio, ART: Anti Retro Viral Therapy, CD4: Cluster of Differentiation 4,CI: Confidence Interval, CIN:Carcinoma Insitu, HAART: Highly Active Antiretroviral Treatment, HIV: Human Immune Deficiency Virus, HPV: Human Papilloma Virus, IARC: International Agency for Research on Cancer, ICC: Invasive Cervical Cancer, IRB: Institutional Review Board, OR: Odds Ratio, PCL: Precancerous Cervical Lesion, PCR: Polmerase Chain Reaction, PEPFAR: President's Emergency Plan for AIDS Relief, SD: Standard Deviation, SCJ: Sqaumo-columnar Junction, SDG: Sustainable Development Goal, SIL: Squames Intraepithelial Lesion, STD: Sexual Transmitted Diseases, SPSS: Statistical Package for Social Sciences, VIA: Visual Inspection with Acetic acid, VILI: Visual Inspection with Lugol's Iodine.

Declaration

Ethics Approval and Consent to Participate

This study was approved by the University of Gondar, College of Medicine and Health Sciences, School of Public Health ethics approval committee, and written consent and assent was obtained from all study subjects.

Consent for Publication

Consent for publication is available and can be sent to the editors on request.

Availability of Data and Material

The datasets generated during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Author's contribution

SK contributed in inception, design, analysis, interpretation, drafting and final approval of the revised manuscript for publication. MD Contributed in inception, design, analysis, interpretation, drafting of a research manuscript and final approval of the revised manuscript for publication. KZ contributed in inception, design, analysis, interpretation, drafting of the research and final approval of the revised manuscript for publication. MB contributed in inception, design, analysis, interpretation, drafting the research manuscript and final approval of the revised manuscript for publication. YA contributed in inception, design, analysis, interpretation, drafting the research manuscript and final approval of the revised manuscript for publication.

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Table 1: Socio-demographic characteristic of study participants in the three screening centres, Amhara region, Northwest Ethiopia, 2015.

Characteristics	Frequency	Percentage	Mean ±SD
Age (in years)			35.6±4.2)
20-29	54	12.4	
30-39	233	53.6	
≥40	148	34	
Marital status			
Single	24	5.5	
Married	244	56.1	
Divorced	98	22.5	
Widowed	69	15.9	
Religion			
Orthodox	350	80.5	
Muslim	73	16.8	
Others*	12	2.7	
Occupational status			
Farmer	48	11	
Housewife	138	31.7	
Government employee	155	35.6	
Others**	94	21.6	
Educational status			
No formal education	175	40.1	
Grade 1-8	129	29.7	
Grade 9-12	82	18.9	
Above 12	49	11.3	
Residence			
Urban	370	85.1	
Rural	65	14.9	
Monthly income			
≤ 33 Dollars	278	63.9	
34-64 Dollars	76	17.5	
65-99 Dollars	39	9	
≥100 Dollars	42	9.7	

* Catholic, protestant and 7th day Adventist.
** Student, daily labourer and trade

Table 2: Reproductive health characteristics of study participants in the three screening centres of Amhara region, Northwest Ethiopia, 2015.

Characteristics	Frequency	Percentage	Mean ±SD
Age at menarche			14.62±2.05
15	327	75.2	
≥15	108	24.8	
Age at first sexual intercourse			16.7±2.7
18	305	70.1	
≥18	130	29.9	
Age at first marriage			16.18±3.87
18	267	61.4	
≥18	168	38.6	
Age at first birth			16.77±8.24
18	223	51.3	
≥18	212	48.7	
Lifetime number of sexual partners	3.9±3.5		
1	75	17.2	
≥2	360	82.8	
Parity			2.4±2
0	56	12.9	
1-4	332	76.3	
≥5	47	10.8	
History of abortion			.
Yes	131	30.1	
No	304	69.9	
Family history of cervical cancer			
Yes	6	1.4	
No	429	98.6	
Current contraceptive use			
Yes	147	33.8	
No	288	66.2	
Use of condom during sexual intercourse			
Yes No	189 246	43.4 56.6	
History of STD			
Yes	100	23	
No	335	77	

Table 3: Immunological, behavioural and other characteristics of the study participants, in three screening centres, Northwest Ethiopia, 2015.

Characteristics	Frequency	Percentage	Mean ±SD
Baseline CD4 counts			212 ±133.6
200	253	58.2	
≥ 200	182	41.8	
Recent CD4 count			479 ±203.9
200	34	8.1	
≥ 200	386	91.9	
Current use of HAART			
Yes	420	96.6	
No	15	3.4	
ART clinic follows up duration			
1-6 months	416	95.6	
7-12 months	19	4.4	
Current HAART use duration			Median=36month
1-24 month	166	39.5	
25-48 month	111	26.4	
≥49 month	143	34	
History of smoking			
Yes	11	2.5	
No	424	97.5	

Table 4: Logistic regression analysis of factors associated with precancerous cervical lesion (PCL) in Northwest Ethiopia, 2015.

Characteristics	PCCL		COR (95%CI)	AOR (95%CI)	P-value
	Yes	No			
Age					
20-29	8	48	1.00	1.00	
30-39	65	271	1.44(0.65,3.19)	1.51(0.52,4.39)	
≥40	15	28	3.21(1.21,8.53)	2.97(0.71,10)	0.32
Occupational status					

Farmer	15	33	1.00	1.00	
Housewife	30	108	0.61(0.29,1.27)	0.40(0.16,1.02)	
Got employee	32	123	0.57(0.29,1.18)	0.44(0.17,1.11)	
Others*	11	83	0.29(0.12,0.70)	0.19(0.06,0.64)	0.06
Educational status					
No formal education	34	141	0.60(0.29,1.24)	0.82(0.26,2.59)	
Grade 1-8	31	98	0.79(0.38,1.66)	0.97(0.32,2.92)	
Grade 9-12	9	73	0.31(0.12,0.78)	0.33(0.10,1.09)	0.10
Above 12	14	35	1.00	1.00	
Age at first birth					
18	64	159	3.15(1.89-5.27)	3.36(1.79,5.01)	0.001
≥18	24	188	1.00	1.00	
Number of sexual partners '					
1	6	69	1.00	1.00	
≥2	82	278	3.39(1.42,8.09)	2.91 (1.13,7.52)	0.001
History of STD					
Yes	39	61	3.73(2.26,6.17)	4.04(2.19, 7.44)	0.001
No	49	286	1.00	1.00	
Baseline CD4 counts					
200	77	176	6.80(3.50,13.24)	7.51(3.58,15. 68)	0.001
≥200	11	171	1.00	1.00	

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