



Precancerous cervical lesions and associated factors among women on antiretroviral therapy at Dukem Health Center, Central Ethiopia: A cross-sectional study

Tamiru Mamo Lemma¹ | Elias Teferi Bala²  | Mulatu Ayana Hordofa² | Lencho Kajela Solbana³ 

¹Dukem Health Center, Oromia Health Bureau, Addis Ababa, Ethiopia

²Department of Public Health, Ambo University, Ambo, Ethiopia

³Department of Nursing, College of Health Sciences, Assosa University, Assosa, Ethiopia

Correspondence

Lencho Kajela Solbana, College of Health Sciences, Assosa University, Assosa, Ethiopia.
Email: lejch7@gmail.com

Abstract

Background and Aims: Cervical cancer is a global public health problem and the second most common cancer which leads to morbidity and mortality among women in developing countries like Ethiopia. In Ethiopia, annually 6294 new cervical cancer cases and 4884 deaths are estimated in 2018 alone. This study aimed to assess the prevalence and associated factors of precancerous cervical lesions among women on antiretroviral therapy (ART) at Dukem Health Center, Central Ethiopia.

Methods: An institution-based cross-sectional study was carried out among randomly selected 257 women receiving ART at Dukem Health Center. Data were collected using a pretested structured questionnaire, medical record review, and visual inspection with acetic acid. Collected data were entered into Epi-info 7.4 and exported to SPSS version 26 for analysis. The prevalence of precancerous cervical lesions and the characteristics of study participants were identified. Utilizing both binary and multivariable logistic regression models, the existence and degree of association with precancerous cervical lesions were determined with a p value < 0.05 and a 95% confidence interval.

Results: The prevalence of precancerous cervical lesions was 16% (95% CI: 11.7–20.6). Significant association was found between precancerous cervical lesions and a history of STIs (AOR = 4.30, 95% CI: 1.48–12.49), oral contraceptive use (AOR = 6.56, 95% CI: 2.10–20.50), having multiple lifetime sexual partners (AOR = 2.53; 95% CI: 1.05–6.10), and a recent CD4 count of less than 200 cells/mm³ (AOR: 11.33, 95% CI: 2.88–24.58).

Conclusion: In the study area, the prevalence of precancerous cervical lesions was relatively high. Therefore, concerned bodies are recommended to increase awareness of the prevention of sexually transmitted diseases and limit sexual partners.

KEYWORDS

cervical cancer, Ethiopia, HIV-positive women, precancerous cervical lesions

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Authors. *Health Science Reports* published by Wiley Periodicals LLC.

1 | BACKGROUND

A precancerous cervical lesion is an abnormality in the cells of the cervix that could eventually develop into cervical cancer. A primary cause of this condition is a persistent or chronic infection with human papilloma virus (HPV) which is the most common infection acquired during sexual relations, usually early at a young age.^{1,2} Precancerous cervical lesions are potentially preventable reproductive organ cancers.^{2,3} It shows pathological changes that may be preliminary to malignancy.^{4,5}

Women with HIV are more likely to have persistent HPV infections leading to precervical lesions.⁶ The late detection of precancerous lesions is related to a low rate of survival after surgery or radiotherapy.^{7,8} Although most HPV infections and precancerous lesions disappear on their own, there is a risk that HPV infection may become chronic and precancerous lesions will progress to invasive cervical cancer in all women.⁹ The World Health Organization (WHO) recommends priority targeting the HPV vaccine for girls ages 9–13 years. Screening and prompt treatment are the most effective methods to reduce the chance of women already exposed to the virus from developing cervical cancer.^{10,11} WHO currently recommends a high-quality screening program through visual inspection with acetic acid (VIA) in low-resource settings and HPV vaccination to overcome this situation.^{12,13} VIA is one of the screening modalities for cervical precancerous lesions, which provides quick results and helps to get early treatment.^{7,8,14}

In Sub-Saharan African countries, about 80% of cervical cancer are detected in advanced stages when very little can be done to treat the disease.¹⁵ In Ethiopia, annually 6294 new cervical cancer cases and 4884 deaths are estimated in 2018.¹⁶ Smoking, high parity, long-term hormonal contraceptive use, and co-infection with HIV have been identified as cofactors of precancerous cervical lesions.¹⁶ Other factors that play a role in both persistent HPV infection and progression to cervical cancer include poor quality health care, clinical stage, socioeconomic, reproductive, and behavioral related factors.^{9–11} In immune-compromised patients, precancerous cervical lesions and cervical cancer are thought to be aggravated and progress more rapidly.^{17,18} Cervical lesions are three times more common in HIV-positive women.¹⁹

Cervical cancer screening coverage in developing countries is only 19% compared with 63% in developed countries. To this end, a 1% or less screening rate was observed in countries such as Bangladesh, Ethiopia, and Myanmar.^{9,20} An 88% cure rate was

reported in a study conducted on the effects of cryotherapy in India.²¹ Despite this, there was no screening service and subsequent management of precancerous cervical lesions in HIV-infected women in the study area. In addition, there was no evidence of the prevalence of precancerous cervical lesions among women on antiretroviral treatment in the study area. Therefore, this study aimed to assess the prevalence of precancerous cervical lesions and associated factors among women on antiretroviral treatment at Dukem Health Center, Ethiopia.

2 | METHODS

2.1 | Study design, setting, and populations

An institution-based cross-sectional study was conducted among 257 randomly selected women on antiretroviral therapy (ART) at Dukem Health Center, Ethiopia from October 1, 2021, to January 30, 2022. The source populations were all HIV-positive women aged ≥ 18 years who were registered and attending the ART clinic at Dukem Health Center. The study population were all randomly selected women, who were registered and attending the ART clinic at Dukem Health Center, and whose age was ≥ 18 years. We excluded women who were unable to provide the necessary information due to critical illness, had a hysterectomy, were in menstruation during the study period, and were postpartum.

2.2 | Sample size determination and sampling technique

The sample size for the study was determined manually using a single population formula and EPI-Info version 7.0 (Table 1) to obtain the largest sample size. Using the single population proportion formula, with assumptions; 18.7%²³ of prevalence (p) of the problem, 5% margin of error (d), and $z_{\alpha/2} = 1.96$;

$$n = \frac{(z_{\alpha/2})^2 pq}{d^2} \quad n = \frac{(1.96)^2 0.187(0.187)}{0.05^2} \quad n = 234.$$

The largest sample size was 257 after adding a 10%²⁴ for nonresponse rate. Then, a simple random sampling technique was applied to select the estimated samples from a list of 587 women taking ART in the study area.

TABLE 1 Parameters used and sample size calculated using EPI-Info.

Associated factor	Proportion of precancerous cell		AOR	Allocation	Confidence level, power	N	Reference
	Exposed	Nonexposed					
Age at first birth	28.7%	11.3%	2.88	1:1	95%, 80%	186	[22]
History of STI	23.8%	4%	4.50	1:1	95%, 80%	114	[9]
Marital status	10.8%	50%	2.13	1:1	95%, 80%	52	[9]

2.3 | Ethical approval and consent to participate

Ethical clearance was obtained from the Ambo University College of Medicine and Health Sciences ethical review board. By covering transportation fees, study participants who were not on appointment during the study period were invited for cervical cancer screening. Written informed consent was obtained from each before data and sample collection after telling them the purpose of the study. In addition, participants' information was not disclosed to anyone else, we also did not collect the name of study participants or any other personal identifier. Women who had VIA test-positive results and were eligible for treatment were counseled and linked with treatment with cryotherapy.

2.4 | Study variables

The dependent variable of the study was precancerous cervical lesions. The independent variables were sociodemographic factors (age, educational status, marital status, monthly income level, and occupation), reproductive Health factors (age at first sexual intercourse, age at first delivery, number of deliveries, age at first marriage, abortion, and oral contraceptive use), and sexual behavioral factors (lifetime number of sexual partners, history of smoking, condom utilization, and alcohol drinking).

2.5 | Operational definitions

VIA Positive test result: the presence of raised and thickened white plaques or acetowhite epithelium, usually near the Squamocolumnar junction (SCJ).²⁴

VIA Negative test result: the presence of smooth, pink, uniform, and featureless cervix; cervical ectropion; polyp; cervicitis; inflammation; and/or nabothian cyst after applying a dilute solution of acetic acid.²⁴

Eligible for cryotherapy: acetowhite lesion <75% of the cervix; lesion does not extend onto the vaginal wall; and lesion extends <2 mm beyond the diameter of the cryoprobe.²⁴

Ineligible for cryotherapy: acetowhite lesion >75% of the cervix; lesion extends into the vaginal wall; lesion extends >2 mm beyond the diameter of the cryotip and lesion suspicious for cancer.²⁴

Suspicious for cancer: the presence of cauliflower-like growth or ulcer; fungating and bleeding mass.²⁴

2.6 | Data collection tools, process, and quality assurance

A questionnaire adapted from reviewing similar studies and VIA was used. It was prepared in English and then translated into the Afan Oromo and Amharic languages. A face-to-face interview using structured questions, VIA procedure, and secondary data from individual patient folders (CD4 count, history of STI) was conducted.

Data were collected by three BSc Nurses and two Midwives who have training in basic cervical cancer screening using VIA and cryotherapy treatment. In addition, a 1-day training was given for data collectors before data collection on the screening procedure. Furthermore, the questionnaire was pretested on 5% of the sample size in a similar study population at a health center in Bishoftu town before the actual data collection.

2.7 | Data processing and analysis

The data were cleaned, entered into Epi Info version 7.4, and exported to SPSS version 26 for analysis. Descriptive statistics were performed and presented in the form of mean, standard deviation, frequency, and percent. Bivariable and multivariable logistic regression were used to identify factors significantly associated with precancerous cervical lesions. Variables with a p value < 0.25 in bivariable logistic regression were selected for multivariable logistic regression. Multivariable analysis was done to determine the presence of a statistically significant association between independent variables and the dependent variable at 0.05 along with a 95% CI of adjusted odds ratio (AOR). The multicollinearity between independent variables was done using the variance inflation factor (VIF).

3 | RESULTS

3.1 | Sociodemographic characteristics

All 257 clients aged over 18 years were screened by VIA in the study area yielding a 100% response rate. More than half (58%) of them were in the age range of 30–39 years, with a mean age of 35.05 (\pm SD 6.5) years. About 29.2% of respondents were housewives by occupation and nearly half (45.5%) of them had a family monthly income of less than 1500 Ethiopian birr (ETB) (Table 2).

3.2 | Reproductive health-related characteristics

The mean age at first sexual intercourse was 16.26 years ($SD \pm 2.346$). In addition, the mean age at first marriage was 17.42 years ($SD \pm 2.451$). About 66.5% of them had their first sexual intercourse at an age younger than 18 years. Half of the respondents (50.6%) married at the age of over 18 years. Nearly Half of the respondents (51.25%) were 18 years and above when they gave their first birth and 34.6% of them have experienced abortion (Table 3).

3.3 | Sexual behavior characteristics

In this study, about 55.2% and 44.8% used condoms sometimes and always respectively during sexual intercourse. In addition, 52.5% and

TABLE 2 Sociodemographic characteristics of women on ART at Dukem Health Center, Ethiopia (n = 257).

Variables	Categories	Frequency	%
Age in years	<20	1	0.5
	20–29	39	15
	30–39	149	58
	≥40	68	26.5
Marital status	Married	132	51.4
	Divorce	78	30.4
	Widowed	38	14.8
	Single	9	3.5
Education	No education	105	40.9
	Primary (1–8)	94	36.6
	Secondary (9–12)	32	12.5
	Diploma/Degree/above	26	10
Occupation	Housewife	75	29.2
	Private/NGO employee	67	26.1
	Merchant	55	21.4
	Daily laborer	41	16
	Government employee	13	5.1
	Others ^a	6	2.3
Family income in birr	≤1500	117	45.5
	1501–3000	100	38.9
	3001–4500	25	9.7
	>4500	15	5.8

^aCommercial sex worker (CSW) and student.

10.1% of the study participants had two or more sexual partners in their lifetime and a history of alcohol drinking respectively (Table 4).

3.4 | Clinical factors

It was also identified that about 8.9% had a history of sexually transmitted infections (STIs). In addition, an estimated 82.1% and 95.3% had baseline and recent CD4 counts >200 copies/mm³ respectively.

3.5 | Prevalence of precancerous cervical lesions

This study revealed that 41(16%, 95% CI: 11.7–20.6) of the study participants had positive precancerous cervical lesions. Of those who were VIA positive, nearly all (97.6%) were eligible for cryotherapy and were treated by cryotherapy during the study period (Table 5).

TABLE 3 Reproductive health-related characteristics of the women on antiretroviral treatment at Dukem Health Center, Ethiopia (n = 257).

Variables	Categories	Frequency	%
Age of first sexual intercourse	<15	63	24.5
	15–17	108	42.0
	>18	86	33.5
Age at first marriage (n = 247)	<18	122	49.4
	≥18	125	50.6
Ever use of contraceptive	Yes	94	36.6
	No	163	63.4
Give birth	Yes	240	93.4
	No	17	6.6
Parity	≤1	17	6.6
	1–4	222	86.4
	≥5	18	7
Age of first birth (n = 240)	<18	117	48.75
	≥18	123	51.25
History of abortion	Yes	89	34.6
	No	168	65.4

TABLE 4 Sexual behavior characteristics of women on antiretroviral treatment at Dukem Health Center, Ethiopia (n = 257).

Variables	Categories	Frequency	%
Condom utilization (n = 38)	Sometimes	21	55.2
	Always	17	44.8
Lifetime number of sexual partners	1	122	47.5
	≥2	135	52.5
Alcohol drinking	Yes	26	10.1
	No	231	89.9

One woman had Suspected invasive cervical cancer and she was referred to a hospital for further diagnosis and treatment.

3.6 | Factors associated with precancerous cervical lesions

In bivariable logistic regression, marital status, age at first marriage, age of first sex, age of first birth, use of oral contraceptive pills, having a history of abortion, number of sexual partners, history of STI, baseline and recent CD4 count were found to be candidate variable for the final model. In multivariable logistic regression analysis taking oral contraceptive pills (AOR = 6.56, 95% CI = 2.10–20.51), history of STI (AOR = 4.30, 95% CI: 1.48–12.49),

two or more sexual partners (AOR = 2.53, 95% CI: 1.05–6.10), recent CD4 count <200 (AOR = 11.33, 95% CI: 2.88–24.58) were significantly associated with precancerous cervical lesion (PCCL) (Table 6).

4 | DISCUSSION

This study aimed to assess the prevalence and associated factors of precancerous cervical lesions among Women on ART at Dukem Health Center, Ethiopia. The prevalence of precancerous cervical

lesions among HIV-positive women was 16% (95% CI: 11.7–20.6). This prevalence is comparable to a study in southwest Ethiopia.²³ Nevertheless, this prevalence is lower than the finding of a study done in Kenya which was 9%.²⁵ This finding is higher than a finding of studies conducted in Amhara region, Ethiopia, Zambia, Tanzania, Nigeria, Rwanda, and Uganda.^{9,26–31} The possible reason for the observed discrepancy might be due to differences in participants' health-seeking behavior, availability and accessibility of the VIA test, provider's experience with screening, and differences in the sexual practices of the women.

The present study found women having a history of STIs were 4.3 times more likely than noninfected women to develop precancerous cervical lesions. This finding is supported by studies conducted in the Amhara regional state and northwest Ethiopia.^{9,22} The possible reason for this might be due to HPV infection is more prevalent in individuals with STIs and different STIs can facilitate HPV virus transmission.^{32,33} Therefore, women having other STIs in addition to HIV should be checked for precancerous cervical lesions.

The present study also found that the prevalence of precancerous cervical lesions was 6.56 times higher for women who used oral contraceptives than for those who did not. Research results from the Amhara Region, Ethiopia, and South Africa support this finding.^{9,22} This association may occur from the alteration of cervix cells caused by oral contraceptive pills, which increases their vulnerability to chronic high-risk HPV infection.³⁴ Therefore, more longitudinal research should be done to strengthen the association between oral contraceptive use and PCCL among HIV-positive women. In addition, alternative family planning should be suggested for those women.

The present study also found that women who had several sexual partners throughout their lives had a 2.53-fold increased risk of developing precancerous cervical lesions as compared with women who had a single sexual partner. Studies carried undertaken in the southwest,²³ northwest,²² and south of Ethiopia³⁵ corroborate

TABLE 5 Clinical characteristics of women on antiretroviral treatment at Dukem Health Center, Ethiopia (n = 257).

Variables	Categories	Frequency	%
History of STI	Yes	23	8.9
	No	234	91.1
Current HAART use duration in years	<1	12	4.7
	1–3	17	6.6
	>3	228	88.7
Baseline CD4 count	<200 cells/mm ³	46	17.9
	≥200 cells/mm ³	211	82.1
Recent CD4 count (n = 251)	<200 cells/mm ³	12	4.7
	≥200 cells/mm ³	239	95.3
VIA test result	Positive	41	16.0
	Negative	216	84.0
Cryotherapy eligibility (n = 41)	Yes	40	97.6
	No	1	2.4

Abbreviations: CD4, cluster of differentiation 4; HAART, highly active antiretroviral therapy; STI, sexually transmitted infection; VIA, visual inspection with acetic acid.

TABLE 6 Bivariate and multivariable logistic regression analysis of factors associated with PCCL among women on antiretroviral treatment at Dukem Health Center, Ethiopia.

Variable	Categories	VIA result		Odds ratio		p Value
		Positive (%)	Negative (%)	COR (95%CI)	AOR(95%CI)	
Taking OCP	Yes	10 (55.5)	8 (44.5)	8.39 (3.0–22.88)	6.56 (2.10–20.51)	0.001*
	No	31 (13)	208 (87)	1	1	
History of STI	Yes	12 (52.17)	11 (47.8)	7.71 (3.11–19.07)	4.30 (1.48–12.49)	0.0007*
	No	29 (12.4)	205 (87.6)	1	1	
Life time's sexual partners	≥2	31 (23)	104 (77)	3.33 (1.56–7.14)	2.53 (1.05–6.10)	0.039*
	1	10 (8.2)	112 (91.8)	1	1	
Recent CD4 count	<200	8 (66.6)	4 (33.4)	12.48 (3.55–43.80)	11.33 (2.88–24.58)	0.001*
	≥200	33 (13.8)	206 (86.2)	1	1	

Abbreviations: AOR, adjusted odds ratio; CD4, cluster of differentiation 4; CI, confidence interval; COR, crude odds ratio; OCP, oral contraceptive pills; PCCL, precancerous cervical lesion; STI, sexually transmitted infection; VIA, visual inspection with acetic acid.

*Significant at $p < 0.05$.

this finding. Unprotected sexual contact is one way that HPV can spread from one person to another, which may account for the higher risk of HPV among women who have multiple sexual partners.³² Therefore, in addition to counseling women to restrict the number of sexual partners to reduce the incidence of PCCL, health professionals who regularly provide care for HIV-positive women should also recommend the VIA test.

According to this study finding, precancerous cervical lesions were 11.3 times more likely among women with a recent CD4 count of less than 200 cells/mm³ than in those with a count of more than 200 cells/mm³. This finding is corroborated by a study conducted at three clinics in Amhara region²² and Mekele³⁶ Ethiopia. The effect of the immune role may be the explanation for women with CD4 counts <200 cells/mm³ having a higher risk of PCCL. In other words, HIV lowers immune function, which makes it harder to control infection and slow the development of cervical lesions.

4.1 | Limitations of study

Given that the research was cross-sectional, temporality was overlooked when characterizing the cause-and-effect relationship between the exposure and outcome variables. In addition, a precancerous cervical lesion was evaluated only based on the results of the VIA test, which may have overlooked a visually undetectable PCCL because of its low sensitivity and specificity. Furthermore, because the study was carried out at a health center, the results might not apply to HIV-positive individuals who were not enrolled in treatment at the time the data were collected. On the other hand, since the recent CD4 count and history of STIs were taken from the patient card (secondary data) we could not able to control its quality at initial data collection.

5 | CONCLUSION

This study found a relatively high prevalence of precancerous cervical lesions. There was a significant relationship found between precancerous cervical lesions and the use of oral contraceptive pills, history of STI, having two or more lifetime sexual partners, and a recent CD4 count of fewer than 200 cells/mm³.

Therefore, it is recommended for concerned bodies that HIV-positive women be included in the screening and treatment programs offered at primary health care units and that nonhormonal contraception methods be specifically targeted for them. Additionally, education and therapy should be provided to bring about behavioral changes about multiple sexual partners and STDs.

AUTHOR CONTRIBUTIONS

Tamiru Mamo Lemma: Conceptualization; investigation; methodology; writing—review and editing; software; formal analysis; writing—original draft; data curation; supervision; visualization. **Elias Teferi Bala:** Conceptualization; investigation; methodology; software;

formal analysis; data curation; supervision; writing—review and editing; writing—original draft; visualization. **Mulatu Ayana Hordofa:** Conceptualization; investigation; writing—original draft; methodology; visualization; writing—review and editing; software; formal analysis; data curation; supervision. **Lencho Kajela Solbana:** Conceptualization; investigation; writing—original draft; methodology; visualization; writing—review and editing; software; formal analysis; data curation; supervision.

ACKNOWLEDGMENTS

We would like to thank the study participants for their willingness to participate in this study.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The corresponding author has access to the data set used in this study's analysis, therefore it can be accessed upon reasonable request. All authors have read and approved the final version of the manuscript [corresponding author or manuscript guarantor] had full access to all of the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

TRANSPARENCY STATEMENT

The lead author Lencho Kajela Solbana affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ORCID

Elias Teferi Bala  <http://orcid.org/0000-0002-5000-6609>

Lencho Kajela Solbana  <http://orcid.org/0000-0002-3155-9363>

REFERENCES

1. Menon S, Rossi R, Zdraveska N, et al. Associations between highly active antiretroviral therapy and the presence of HPV, premalignant and malignant cervical lesions in sub-Saharan Africa, a systematic review: current evidence and directions for future research. *BMJ Open*. 2017;7(8):e015123.
2. World Health Organization (WHO). *Comprehensive Cervical Cancer Control: A Guide to Essential Practice*. 2nd ed. World Health Organization; 2014.
3. Nkfusai NC, Mubah TM, Yankam BM, Tambe TA, Cumber SN. Prevalence of precancerous cervical lesions in women attending Mezam Polyclinic Bamenda, Cameroon. *Pan Afr Med J*. 2019;32: 1-12.
4. Bloem P, Ogbuanu I. Vaccination to prevent human papillomavirus infections: from promise to practice. *PLoS Med*. 2017;14(6): e1002325.
5. Abraham AG, D'Souza G, Jing Y, et al. Invasive cervical cancer risk among HIV-infected women: a North American multicohort collaboration prospective study. *J Acquir Immune Defic Syndr*. 2013;62(4): 405-413.

6. Ghebre RG, Grover S, Xu MJ, Chuang LT, Simonds H. Cervical cancer control in HIV-infected women: past, present and future. *Gynecol Oncol Rep*. 2017;21(June):101-108. doi:10.1016/j.gore.2017.07.009
7. FMOH. Guideline for Cervical Cancer Prevention and Control in Ethiopia. Fed Minist Heal Ethiop. 2015;35.
8. Shiferaw N, Salvador-Davila G, Kassahun K, et al. The single-visit approach as a cervical cancer prevention strategy among women with HIV in Ethiopia: successes and lessons learned. *Glob Health Sci Pract*. 2016;4(1):87-98.
9. Belayneh T, Mitiku H, Weldegebreal F. Precancerous cervical lesion and associated factors among HIV-infected women on ART in Amhara Regional State, Ethiopia: a hospital-based cross-sectional study. *Int J Health Sci*. 2019;13(3):4-9. <http://www.ncbi.nlm.nih.gov/pubmed/31123433%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC6512148>
10. Kristina SA, Endarti D, Aditama H. *Global Cancer Facts & Figures* 4th Edition. Vol 29. American Cancer Society; 2018:138-144.
11. Torre LA, Islami F, Siegel RL, Ward EM, Jemal A. Global cancer in women: burden and trends. *Cancer Epidemiol Biomarkers Prevent*. 2017;26(4):444-457.
12. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6):394-424.
13. Jemal A, Bray F, Ferlay J. Global cancer statistics: 2011. *CA Cancer J Clin*. 1999;49(2):133-164. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=10200776
14. Roura E, Castellsagué X, Pawlita M, et al. Smoking as a major risk factor for cervical cancer and pre-cancer: results from the EPIC cohort. *Int J Cancer*. 2014;135(2):453-466.
15. Zibako P, Hlongwa M, Tsikai N, Manyame S, Ginindza TG. Mapping evidence on management of cervical cancer in sub-Saharan Africa: scoping review protocol. *Int J Environ Res Public Health*. 2022;19(15):9207.
16. ICO/IAR. Human Papillomavirus and Related Diseases Report. 2016. www.hpvcentre.com
17. Belete N, Tsige Y, Mellie H. Willingness and acceptability of cervical cancer screening among women living with HIV/AIDS in Addis Ababa, Ethiopia: a cross-sectional study. *Gynecol Oncol Res Pract*. 2015;2(1):6. doi:10.1186/s40661-015-0012-3
18. Shiferaw S, Addissie A, Gizaw M, et al. Knowledge about cervical cancer and barriers toward cervical cancer screening among HIV-positive women attending public health centers in Addis Ababa city, Ethiopia. *Cancer Med*. 2018;7(3):903-912.
19. Denslow SA, Rositch AF, Firnhaber C, Ting J, Smith JS. Incidence and progression of cervical lesions in women with HIV: a systematic global review. *Int J STD AIDS*. 2014;25(3):163-177.
20. Jolly PE, Mthethwa-Hleta S, Padilla LA, et al. Screening, prevalence, and risk factors for cervical lesions among HIV positive and HIV negative women in Swaziland. *BMC Public Health*. 2017;17(1):218.
21. Farah Z, Rajyashri S. A study on the effect of cryotherapy and LEEP in cervical dysplasia. *Biomed Res*. 2012;23(4):533-535.
22. Kassa LS, Dile WM, Zenebe GK, Berta AM. Precancerous lesions of cervix among women infected with HIV in Referral Hospitals of Amhara Region, Northwest Ethiopia: a cross sectional study. *Afr Health Sci*. 2019;19(1):1695-1704.
23. Lemu LG, Woldu BF, Eshetu Teke N, Bogale ND, Wondimene EA. Precancerous cervical lesions among HIV-infected women attending HIV care and treatment clinics in southwest Ethiopia: a cross-sectional study. *Int J Women's Health*. 2021;13:297-303.
24. Deksissa ZM, Tesfamichael FA, Ferede HA. Prevalence and factors associated with VIA positive result among clients screened at Family Guidance Association of Ethiopia, south west area office, Jimma model clinic, Jimma, Ethiopia 2013: a cross-sectional study. *BMC Res Notes*. 2015;8(1):618.
25. Huchko MJ, Leslie H, Sneden J, et al. Risk factors for cervical precancer detection among previously unscreened HIV-infected women in Western Kenya. *Int J Cancer*. 2014;134(3):740-745.
26. Bateman AC, Katundu K, Mwanahamuntu MH, et al. The burden of cervical pre-cancer and cancer in HIV positive women in Zambia: a modeling study. *BMC Cancer*. 2015;15(1):541.
27. Liu E, McCree R, Mtisi E, et al. Prevalence and risk factors of cervical squamous intraepithelial lesions among HIV-infected women in Dar es Salaam, Tanzania. *Int J STD AIDS*. 2016;27(3):219-225. doi:10.1177/0956462415584466
28. World Health Organization (WHO). Prevention of cervical cancer through screening using visual inspection with acetic acid (VIA) and treatment with cryotherapy. *Outlook*. 2003;11(1):33. <http://www.who.int/reproductivehealth/publications/cancers/9789241503860/en/>
29. Ononogbu U, Almuftaba M, Modibbo F, et al. Cervical cancer risk factors among HIV-infected Nigerian women. *BMC Public Health*. 2013;13(1):582.
30. Makuza JD, Nsanzimana S, Muhimpundu MA, Pace LE, Ntaganira J, Riedel DJ. Prevalence and risk factors for cervical cancer and precancerous lesions in Rwanda. *Pan African Medical Journal*. 2015;22:1-8.
31. Izudi J, Adrawa N, Amongin D. Precancerous cervix in human immunodeficiency virus infected women thirty years old and above in Northern Uganda. *J Oncol*. 2016;2016:1-7.
32. Megersa T, Dango S, Kumsa K, Lemma K, Lencha B. Prevalence of high-risk human papillomavirus infections and associated factors among women living with HIV in Shashemene town public health facilities, Southern Ethiopia. *BMC Womens Health*. 2023;23(1):1-10. doi:10.1186/s12905-023-02279-2
33. Tsehay B, Afework M. Precancerous lesions of the cervix and its determinants among Ethiopian women: systematic review and meta-analysis. *PLoS One*. 2020;15(10 October):0240353. doi:10.1371/journal.pone.0240353
34. Getinet M, Taye M, Ayinalem A, Gitie M. Precancerous lesions of the cervix and associated factors among women of East Gojjam, Northwest Ethiopia, 2020. *Cancer Manag Res*. 2021;13(September):9401-9410.
35. Beyene T, Akibu M, Bekele H, Seyoum W. Risk factors for precancerous cervical lesion among women screened for cervical cancer in south Ethiopia: unmatched case-control study. *PLoS One*. 2021;16(7 July):1-16. doi:10.1371/journal.pone.0254663
36. Gessesse Z, Tadesse Z, Alemayehu M, et al. Determinant factors of visual inspection with acetic acid (VIA) positive lesions among HIV positive women in Mekelle hospital, Northern Ethiopia: a case control study. *Ethiop Med J*. 2015;53(Suppl. 2):17-24.

How to cite this article: Lemma TM, Bala ET, Hordofa MA, Solbana LK. Precancerous cervical lesions and associated factors among women on antiretroviral therapy at Dukem Health Center, Central Ethiopia: a cross-sectional study. *Health Sci Rep*. 2024;7:e1972. doi:10.1002/hsr2.1972