

ORIGINAL ARTICLE

CERVICAL LESION DETECTION USING VISUAL INSPECTION WITH ACETIC ACID AND ASSOCIATED FACTORS AMONG ETHIOPIAN WOMEN

Awoke Derbie, MSc^{1,2*}, Daniel Mekonnen, MSc¹, Yinebeb Mezgebu, MSc³, Fantahun Biadglegne, PhD¹

ABSTRACT

Background: There is inadequate data on the profile of cervical lesions detected by visual inspection with acetic (VIA) among women in Ethiopia and in the study area in particular.

Objective: The aim of this study was to determine the prevalence of VIA positive cervical lesions and its associated factors among women visiting gynecology department of Felege Hiwot Referral Hospital (FHRH).

Methods: A total of 428 women were recruited for the study in the period of December 1, 2016 to June 30, 2017. Demographic related data were collected using a structured questionnaire. The cervix of study participants was visually inspected using 5% acetic acid as per the cervical cancer screening and prevention guideline for low-resource settings. The screening result was recorded based on one of the categories specified on the national VIA screening recording format ('No acetowhite lesion', 'Acetowhite lesion eligible for cryo', 'Acetowhite lesion non eligible for cryo' or 'Suspicious for cancer'). Data were entered and analysed using Statistical Software Package for Social Sciences (SPSS) v23. Generated data were summarized using descriptive statistics. Stepwise logistic regression analysis was conducted to identify factors associated with the odds of having VIA positive lesion. Statistical significance was set at p value < 0.05 .

Results: Most of the study participants were from urban settings (63.1%), married (69.2%), had previously given birth (88.6%), used long term contraceptive (57.7%) and were HIV positive (45.3%). Similarly, the majority (56.5%) were in the age group of 39-49 years with a median age at 35.0 years. Median age at first sexual intercourse was 16 years. More than half of the study participants (62.6%) had multiple sexual partners. The prevalence of VIA positive lesions was 14.3% (95% CI: 11.3-17.9). Out of positive lesions 23.0% (14/61) were suspicious for cervical cancer. Among VIA positive participants, 75.4% (46/61) were eligible for cryotherapy and received the treatment in the screening centre. The odds of having a VIA positive result was lowered by 24% among women who were engaged in private business compared to those who were government employees (AOR: 0.24, 95% CI (0.07-0.85), p value 0.03).

Conclusion: The observed high prevalence of VIA positive result in the study shows the need for strengthening cervical cancer prevention strategies in the study area. Future studies should consider other settings and better diagnostic tools.

Key words: Precancerous cervical lesion, cervical cancer, VIA, FHRH

BACKGROUND

More than 99% of cervical cancer cases are linked to infection with certain types of human papillomaviruses (HPV) (1). There are about 40 varieties (genotypes) of HPV that infect the human genital tract; worldwide, however, 7 types cause approximately 87% of cases of cervical cancer and only 2 types - HPV 16 and 18, cause about 70% of cases (1-3). HPV is common and easily transmitted, so most women are infected with it soon after they become sexually active (4).

About 70% of women in the United States and Europe are screened at least once, if not repeatedly, every five years. However, in developing countries only 5% of women are screened in this same time period (5).

This is because there are too few trained and skilled professionals to implement such a program effectively. In addition, healthcare resources are not available to sustain such a program (3). Some of the identified risk factors for cervical cancer include early marriage, multiple sexual partnerships (3,6), HIV infection (7) and history of sexually transmitted diseases (8).

Ethiopia has a population of 29.43 million women who are 15 years and older and who are at risk of developing cervical cancer (9). It is the leading cause of cancer related mortality among Ethiopian women over the age of 30 as a result of early sexual activity, multiple sexual partners and history of sexually transmitted infections (10).

¹ Department of Medical Microbiology; College of medicine and Health Sciences; Bahir Dar University, Ethiopia.

² Centre for Innovative Drug Development and Therapeutic Trials for Africa, Addis Ababa University, Ethiopia.

³ Department of Physiology, College of medicine and Health Sciences, Bahir Dar University, Ethiopia.

*Corresponding author: awe.love2000@gmail.com

Records show that 7,600 Ethiopian women are diagnosed annually with cervical cancer and of these, 6,000 die of the disease each year (11).

Given the difficulty of preventing infection with HPV, until recently the only strategy for reducing the incidence of cervical cancer has been screening and treatment (1). Cervical cancer screening aims to test the largest possible proportion of women at risk and to ensure appropriate follow-up for those who have a positive or abnormal test result. Such women will need diagnostic testing and follow-up or treatment (3, 12). Early detection and management of precancerous lesions require political and technical input. Challenges faced by countries are lack of awareness of people about cervical cancer, absence of a policy framework, inadequate infrastructure, insufficient data and evidence (3, 10).

There are several approaches to screening for cervical cancer, including cytological testing (Pap test), HPV DNA testing for high-risk strains of the HPV virus, and visual inspection of the cervix with acetic acid (VIA), with or without magnification (1, 4, 13). Cytological testing is the most common screening method in developed countries, but is mostly inaccessible in developing nations or made available to a very small, select group of women in private facilities, maternal child health sites, or family-planning clinics, missing the age groups at highest risk for precancerous lesions (5).

VIA was reported as an alternative method for screening of cervical cancer in 1982 (14). Application of 3 to 5% acetic acid causes dehydration of cells and surface coagulation of proteins in active cells, giving its white appearance called acetowhite regions (14). VIA is low cost and relatively ease to administer (it can be administered by paramedical workers), its high sensitivity and its immediate results (it is possible to “see and treat” at the first visit) (13, 15, 16) are important factors that make VIA an alternative screening modality for cervical cancer in developing countries (17,18). Because VIA allows diagnosis of abnormal cells almost immediately, women can be treated in the same visit with cryotherapy (applying compressed refrigerant gases (N₂ or CO₂) in transportable cylinders to the cervix), which reduces cost and loss to follow-up (1, 19). Reports showed that VIA has similar or better performance/sensitivity than cytology in detecting cervical neoplasia, while requiring limited resources (20).

In Ethiopia so far there is no well-established cervical cancer screening program (21).

Although there is no robust national data on the screen coverage, a report showed that the VIA coverage is 0.6% (among all women aged 18-69 years who are screened every 3 years) (2).

On top of this, data is not yet available on the burden of HPV infection and the extent of associated precancerous lesions in the general population of Ethiopia (2, 3). Furthermore, the magnitude of VIA positive cervical lesions in the study area is lacking. Taking this into consideration, the aim of the study described in this report was to determine the magnitude of VIA positive cervical lesions in women attending the gynaecological department of FHRH. At the same time the study sought to identify factors associated with the odds of having VIA positive cervical lesions among women attending gynaecological services at FHRH. No prior studies have been carried out in FHRH to estimate the burden of HPV infection, or even in the Amhara region at large. It is expected that the findings from the study would serve as baseline information for further large scale studies.

PATIENTS AND METHODS

Study setting, design and period

A health facility-based cross-sectional study was conducted from December 1, 2016 to June 30, 2017. The study was carried out in women who presented to the gynecology and obstetrics department of FHRH seeking medical care. FHRH is located in Bahir Dar city, the capital of Amhara regional state situated on the southern shore of Lake Tana, the source of the Blue Nile (*'Abay'*). The city is situated approximately 560kms northwest of Addis Ababa, having an elevation of about 1,840 meters above sea level. According to data obtained from the Central Statistical Agency of Ethiopia, the 2007 national census reported a total population of 221, 991 for Bahir Dar of whom 113, 535 were women (9). The hospital serves the population of Bahir Dar and the remote areas of northwest Ethiopia. The total population served by the hospital is estimated to be between 10-12 million.

Population and data collection

Convenient sampling method was used to recruit women who visited FHRH gynaecology and obstetrics department during the study period. A total of 428 women ≥ 30 years who were more likely to have cervical pathology and who presented with indicator signs and symptoms such as abnormal vaginal discharge, vaginal bleeding, bleeding after sexual intercourse or any bleeding after menopause and women who complained of painful sexual intercourse were included in the study.

Additionally women, who were admitted to the hospital for gynaecological problems but before undergoing any surgical procedure, were also included in the study.

Relevant socio-demographic and reproductive related data were collected by using a structured questionnaire. After proper counseling and ensuring their voluntary participation, women were recruited for VIA screening using 5% acetic acid in the hospital VIA center. The screening procedure was performed as per the VIA screening protocol described in the guidelines by a trained nurse (3, 5).

The screening result was documented based on the national VIA screening result recording format as one of the following: 'No acetowhite lesion', 'Acetowhite lesion eligible for cryo', 'Acetowhite lesion non eligible for cryo' or 'Suspicious for cancer' based on the degree of the lesion observed upon addition of the acid. Women with VIA positive result who were eligible for cryotherapy were treated accordingly while ineligible clients and those with lesions suspicious for cancer were referred to physicians for further evaluation and management.

Independent variables were age, residence, educational background, age at first sexual intercourse, use of contraceptives history of sexually transmitted infections (STI), number of sexual partners and HIV sero-status. The dependent variable was VIA screening result.

Data analysis

Data was entered, cleaned and analysed using Statistical Package for Social Sciences (SPSS) version 23 (SPSS Inc., Chicago, IL, USA) for Windows. Statistical summary results were presented as counts, percentages, ranges and median/mean values to describe the study participants. Stepwise logistic regression model was employed to identify factors associated with VIA positive results. Taking their biological plausibility under consideration, all variables were included in the multivariate analysis. For the purpose of the analysis authors classified the VIA result into two groups as described in Table 2. A *p*-value of less than 0.05 was considered to indicate a statistically significant difference.

Operational Definition

The participants' VIA screening results were evaluated according to previously stated criteria in the guidelines (1, 3).

VIA positive: presence of raised and thickened white plaques or acetowhite epithelium, usually near the squamo-columnar junction (SCJ).

VIA negative: 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.

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

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

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

Ethical issues

Ethical clearance was obtained from Bahir Dar University, College of Medicine and Health Sciences ethical review committee. Informed written consent of the study participants was obtained to ensure their willingness to participate in the study after adequate explanation was provided about the purpose, importance and potential benefit of the study. The procedure of VIA screening was explained to all participants. The 'see and treat' approach was implemented; eligible patients with abnormal cervical lesions were treated on the spot. All information from the study participants was maintained in a confidential manner.

RESULTS

Description of demographic and reproductive history of the participants

In this study report 428 women who attended the gynaecology clinic of FHRH were included. Most of the study participants were from urban settings (63.1%), married (69.2%), had previously given birth (88.6%), used long term contraceptives (57.7%) and were HIV positive (45.3%). Similarly, the majority (56.5%) were in the age range of 39-49 years with a median age of 35.0 years (range: 17-60 years). The median age at first sexual intercourse was 16 years (range 9-30 years). Furthermore, 39.0% and 1.2% of participants reported that they had previous experience of sexually transmitted infections (STI) and tobacco smoking, respectively. More than half of the study participants (62.6%) had multiple sexual partners. Among those participants who gave birth, 45.3% gave ≥ 3 births (multiparous) with the median number of births at 2 (range: 1-11) (Table 1).

Table 1. Socio-demographic and reproductive characteristics of women screened using VIA at Felege Hiwot Referral Hospital, Bahir Dar, Dec. 2016 -June-2017.

Variable		Frequency (%)
Address	Urban	270 (63.1)
	Rural	158 (36.9)
Age groups in years	17-27	1(0.2)
	28-38	46 (10.7)
	39-49	242 (56.5)
	50-60	139 (32.5)
Occupation	Government employee	347 (81.1)
	Private business	81 (18.9)
Marital status	Single	20 (4.7)
	Married	296 (69.2)
	Divorced	78 (18.2)
	Widowed	34 (7.9)
Previously given birth	Yes	379 (88.6)
	No	49 (11.4)
Parity	0	49 (11.4)
	1	98 (22.9)
	2	87 (20.3)
	≥ 3	194 (45.3)
History of tobacco smoking	Yes	5 (1.2)
	No	423 (98.8)
Use of long term contraceptive	Yes	247 (57.7)
	No	181(42.3)
History of STI*	Yes	167 (39.0)
	No	261 (61.0)
HIV status	HIV positive	194 (45.3)
	HIV negative	121(28.3)
	Unknown	113 (26.4)

VIA screening result

The VIA screening result of the participants is presented in Table 2. Most of the screened clients (85.7%) were without acetowhite lesions (i.e. VIA negative). The remaining 61 individuals (14.3%; 95%CI: 11.3-17.9) had positive cervical lesions, of which 14 individuals (23%; 95% CI: 14.2- 34.9) were suspicious for

Among VIA positive participants 75.4% were eligible for cryotherapy and received the treatment. The remaining 15 VIA positive cases were referred for further medical evaluation and management (Table 2).

Table 2. VIA screening result, cryotherapy and reasons for referral in women who underwent cervical screening at Felege Hiwot Referral Hospital, Bahir Dar, Dec. 2016- June 2017.

Variable	Frequency (%)	
VIA screening result (n=428)	No acetowhite lesion*	367 (85.7)
	Acetowhite lesion eligible for cryo.	46 (10.7)
	Acetowhite lesion not eligible for cryo.	1 (0.2)
	Suspicious for cancer	14 (3.3)
Treatment given (n=428)	No treatment	382 (89.3)
	Cryotherapy	46 (10.7)
Reason for referral (n=15)	Suspicious for cancer	14 (93.3)
	Lesion not eligible for cryo.	1 (6.7)

*VIA Negative: No acetowhite lesion. The rest of the VIA screening results were considered to be VIA positive for ease of presentation and logistic regression analysis.

Factors Associated with abnormal cervical lesion

Most of the variables tested in the logistic regression model did not show any statistically significant association.

However, the odds of having a VIA positive result was lower by 24% among women who were engaged in private businesses compared to women who were government employees (Adjusted OR: 0.24, 95% CI 0.07-0.85, *p* value 0.03) (Table 3).

Table 3. Logistic regression analysis of VIA positive results at Felege Hiwot Referral Hospital, December 2016- June 2017.

Variables		VIA screening result		cOR (95% CI)	aOR (95% CI), <i>p</i> value
		Positive (%)	Negative (%)		
Address	Urban	36 (13.3)	234 (86.7)	1	1
	Rural	25 (15.8)	133(84.2)	0.82 (0.47-1.42)	0.94(0.50-1.80), 0.60
Age group (years)	28-38	4 (8.7)	42 (91.3)	1	1
	39-49	33 (13.6)	209 (86.4)	0.69 (0.20-1.80)	0.48(0.57-1.47), 0.55
	50-60	23 (16.5)	116 (83.5)	0.48 (0.16-1.47)	0.80 (0.45-1.42), 0.36
Age at sexual debut (years)	<16	37 (17.1)	180 (82.9)	1	1
	≥ 16	24 (11.4)	187 (88.6)	1.60 (0.92-2.78)	1.60 (0.92-2.78), 0.49
Educational status	Illiterate	26 (13.9)	161 (86.1)	1	1
	Primary/secondary school	25 (16.0)	131 (84.0)	0.84 (0.47-1.54)	0.35(0.11-1.14), 0.052
	College	10 (11.8)	75 (88.2)	1.21 (0.56-2.64)	0.46(0.15-1.43), 0.13
Occupation	Government	6 (7.4)	75 (92.6)	1	1
	Private	55 (17.5)	292 (82.5)	0.42 (0.18-1.02)	0.24(0.07-0.85), 0.03*
Marital status	Single	3 (15.0)	17 (85.0)	1	1
	Married	41 (13.9)	255 (86.1)	1.10 (0.31-3.91)	0.74(0.11-5.04), 0.84
	Divorced	12 (15.4)	66 (84.6)	0.97 (0.25-3.83)	0.95 (0.32-2.8), 0.91
	Widowed	5 (14.7)	29 (85.3)	1.02 (0.22-4.82)	0.93(0.29-3.05), 0.99
Previously given birth	Yes	56 (14.8)	323 (85.2)	1	1
	No	5 (10.2)	44 (89.8)	2.12 (0.81-5.60)	1.8(0.05-65.25), 0.58
Parity	0	5(10.2)	44(89.8)	1	1
	1	14 (14.3)	84 (85.7)	0.68 (0.23-2.01)	0.75(0.21-2.61), 0.82
	2	13 (14.9)	74 (85.1)	0.64 (0.22-1.93)	1.13(0.52-2.45), 0.65
	≥3	29 (14.9)	165 (85.1)	0.64 (0.23-1.76)	1.15(0.53-2.51), 0.81
Number of sexual partners	1	18 (11.2)	142 (88.8)	1	1
	≥2	43 (16.0)	225 (84.0)	0.66 (0.37-1.19)	1.35 (0.74-2.47), 0.88
History of tobacco smoking	Yes	1 (20.0)	4 (80.0)	0.50 (0.05-4.79)	1
	No	60 (14.2)	363 (85.8)	0.77(0.44-1.34)	1.28(0.12-13.19), 0.73
Use of long term contraceptive	Yes	36 (14.6)	211 (85.4)	1	1
	No	25 (13.8)	156 (86.2)	1.06 (0.61-1.84)	1.27(0.68-2.37), 0.39
History of STI	Yes	28 (16.8)	139 (83.2)	1	1
	No	33 (12.6)	228 (87.4)	1.40 (0.80-2.40)	1.3 (0.73-2.31), 0.44
HIV status	Positive	33 (17.0)	161 (83.0)	1	1
	Negative	14 (11.6)	107 (88.4)	1.57 (0.80-3.06)	1.4 (0.63-3.15), 0.22
	Unknown	14 (12.4)	99 (87.6)	1.44 (0.73-2.84)	0.82(0.36-1.89), 0.68

STI: sexually transmitted infection

DISCUSSION

Cervical cancer is preventable when precancerous lesions are identified and treated early (5, 10). Challenges faced by countries in the prevention aspects include a lack of public awareness about cervical cancer (CC), absence of a policy framework, inadequate infrastructure, insufficiency of data and evidence to guide policy making (10). Ethiopia is not exceptional in this regard where the health surveillance system with regard to cancer screening is poor.

Most (56.5%) of the 428 women included in this study were in the age bracket 39-49 years. A total of 45.3% were HIV positive. These figures are in accordance with the national VIA screening guideline of Ethiopia which targets women having a similar profile as those described in this study. One of the screening recommendations is to include sexually experienced women aged 30 years and above (median age in the present study was 35 years). Similarly, all HIV positive women regardless of their age are eligible for VIA screening because they are at an even greater risk of developing cervical cancer (1,3). Furthermore, 39.0% of participants had a previous history of sexually transmitted infections (STI).

In this study the median age at first sexual intercourse was 16 years. The figure is similar to the findings from a study by Gessesse *et al.* in northern Ethiopia (22) where the median age of sexual debut of study subjects was 17 years. This confirms the fact that early sexual engagement is a common practice in Ethiopia that may put girls at risk of contracting sexually transmitted infections such as human papillomavirus (HPV) infections. In addition 268 (62.6%) of the participants had multiple sexual partners (≥ 2), a practice which could lead them to contract various STIs.

The prevalence of VIA positive lesions was 14.3%. Of these, 23% (14/61) were reported to be suspicious for cancer. Similar findings have been reported in a study by Mulisa *et al* from Jimma where out of 334 women, the prevalence of VIA positive results was 12.9% (6). Another study from rural Ethiopia found a prevalence of 15.9% (23). Elsewhere in Africa a prevalence of 12% and 24% was found in Egypt (18) and Sudan respectively (20). Other studies from the southern and northern parts of Ethiopia have reported the prevalence of VIA positive cervical lesions among HIV positive women to be 22.1% and 22.4% respectively (8, 22). In the present study where the HIV prevalence was high (45.3%), the prevalence of VIA positive cervical lesions amongst this group of women was

The difference might be attributed to sample size disparity and possibly, the different stages of HPV infection of the women who took part in the various studies. The relatively higher prevalence of VIA positive cervical lesions among HIV positive women might be due to their immune deficient status.

VIA positive participants who were eligible for cryotherapy were treated accordingly in the centre. The remainder of the VIA positive cases were referred for further medical evaluation and management. Colposcopy and biopsy are often used to reach a specific diagnosis of the extent of the abnormality in women with a positive VIA screening test (3) however these technologies are not yet available in the FHRH set up. It is also important to consider HPV based cervical cancer screening tools in Ethiopia where technologies like colposcopy and cervical histology are not easily accessible due to their cost and skilled human resource demand.

With regard to predictors for VIA positive cervical lesions, the odds of having a positive result was 24% lower among women who had private businesses compared to women working in government jobs. This might be related to differences in accessibility of health related information as awareness is a critical step to undertake preventive measures (24). It is also reported that lack of awareness and poor health seeking behavior for cervical cancer are common in Ethiopia due to misconceptions about the cause of the disease. Hence, socio-cultural barriers and health service related factors that influence health seeking behavior must be addressed (24).

None of the other variables included in the analysis such as place of residence (urban/rural), age of the women, age at sexual debut, educational status, marital status, previous history of giving birth, parity, number of sexual partners, history of tobacco smoking, use of long term contraceptives, history of STI, and HIV status showed a statistically significant association with VIA positive cervical lesion results ($p > 0.05$) although an association was demonstrated for some of these variables in other studies. To mention an example, having multiple sexual partners and a history of sexually transmitted diseases were reported as being predictors for VIA positive results in other studies done in Ethiopia (6, 8, 22). The difference might be due to difference in sample size and because of the statistical pooling effect of the reference groups.

Our findings are subject to at least three limitations. First, because of the absence of a facility it was not possible to evaluate the performance of the VIA screening tool against the gold standard (cervical histology). Secondly, selection bias may have been a factor as all were women who presented to a health facility seeking medical care, and who by implication, were not healthy. Screening ideally should be carried out on apparently healthy women in the general population. In our case, the fact that all study participants were recruited from a hospital setting may have biased the findings. Thirdly, due to the cross-sectional nature of this study it was not possible to trace the cryotherapy treatment outcome of eligible patients. The Federal Ministry of Health of Ethiopia recommends repeating the screening after one year following abnormal results and/or treatment [3]. However, to the best of our knowledge this study is the first of its kind in the study area which has attempted to provide baseline information about the magnitude of VIA positive cervical lesions. Such information will provide useful input for further large scale studies in the future.

CONCLUSION

The observed high prevalence of VIA positive results in the study shows the need for strengthening cervical cancer prevention strategies in the study area. Future studies should consider other settings and a better diagnostic tool.

REFERENCES

1. World Health Organization. Guidelines for screening and treatment of precancerous lesions for cervical cancer prevention. World Health Organization, 2013.
2. World Health Organization. Human Papillomavirus and Related Cancers in the World. Summary Report 2010.
3. Federal Ministry of Health. Guideline for Cervical Cancer Prevention and Control in Ethiopia, 2013.
4. Maine D, Hurlburt S, Greeson D. Cervical Cancer Prevention in the 21st Century: Cost Is Not the Only Issue. *Am J Public Health*. 2011; 101(9):1549-55.
5. Carr C, W.Sellors J. Cervical Cancer Screening in Low Resource Settings Using Visual Inspection With Acetic Acid. *Journal of Midwifery & Women's Health*. 2004; 49:329-37.
6. Mulisa Z, Alemseged F, Assefa H. 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 Research Notes*. 2015; 8(618). doi: 10.1186/s13104-015-1594-x.
7. Memiah P, Mbuthia W, Kiiru G, Agbor S, Odhiambo F, Ojoo S, Biadgilign S. Prevalence and Risk Factors Associated with Precancerous Cervical Cancer Lesions among HIV-Infected Women in Resource-Limited Settings. *AIDS Res Treat*. 2012; 953743. doi: 10.1155/2012/953743.
8. Gedefaw A, Astatkie A, Tessema GA. The Prevalence of Precancerous Cervical Cancer Lesion among HIV-Infected Women in Southern Ethiopia: A Cross-Sectional Study. *PLoS ONE* 2013, 8(12):e84519. doi: 10.1371/journal.pone.0084519.

ACKNOWLEDGMENTS

We would like to thank the College of Medicine and Health Sciences of Bahir Dar University for its financial support. Our deep appreciation also goes to the staff working in the VIA centre of Felege Hiwot Referral Hospital as well as to all the study participants.

Conflict of interest

None.

Funding

This research was funded by Bahir Dar University.

Authors' contributions

Awoke Derbie, Daniel Mekonnen and Yinebeb Mezgebu, were involved in the design and implementation of the study, statistical analysis and in drafting the manuscript. FB critically reviewed and revised the manuscript and contributed to its scientific contents. All authors have read and approved the final manuscript.

10. World Health Organization: Regional office for Africa. Prevention of Cervical Cancer. 2016.
11. Path Finder International Ethiopia (PFIE): Combating Cervical Cancer in Ethiopia-Addis Tesfa. In. Addis Ababa; 2010. Available at: <https://www.pathfinder.org/publications/combating-cervical-cancer-ethiopia-addis-tesfa/>. Accessed on Jul 2017.
12. Gaffikin L, Wittet S, Sherns J. Expanding paradigms for cervical cancer screening; The impact of the Alliance for Cervical Cancer Prevention, 2013. Available at: http://www.rho.org/files/ACCP_impact_paper_2013.pdf. Accessed on May 2017.
13. Ardahan M, Temel AB. Visual Inspection With Acetic Acid in Cervical Cancer Screening. *Cancer Nurs*. 2011; 34(2):158-63.
14. Puri N, Khullar H, Verma K, Mediratta G. Visual inspection with acetic acid a screening method for cervical lesions. *Current Medicine Research and Practice*. 2014; 4(4):152-5.
15. Goel A, Gandhi G, Batra S, Bhambhani S, Zutshi V, Sachdeva P. Visual inspection of the cervix with acetic acid for cervical intraepithelial lesions. *International Journal of Gynecology & Obstetrics*. 2005; 88(1):25-30.
16. Khan M, Sultana S, Jabeen N, Arain U, Khan S: Visual inspection of cervix with acetic acid: a good alternative to pap smear for cervical cancer screening in resource-limited settings. *J Pak Med Assoc*. 2015; 65(2):192-5.
17. Shaheen, S, Sharma R, Rashi R. Visual Inspection with Acetic Acid (VIA) in cervical cancer screening in low resource settings. *Bangladesh Journal of Medical Science*. 2014;13(04):454-9.
18. Saleh HS. Can visual inspection with acetic acid be used as an alternative to Pap smear in screening cervical cancer? *Middle East Fertility Society Journal*. 2014; 19(3):187-91.
19. World Health Organization. Alliance for Cervical Cancer Prevention (ACCP). Planning and Implementing Cervical Cancer Prevention and Control Programs: A Manual for Managers. 2004.
20. Shammatt IM, Mohammed ZI, Alnayal MD, Elsadig M. Direct visual inspection of the cervix with acetic acid for the detection of premalignant lesions. *Sudan Medical Laboratory Journal*. 2015; 2(2):36-47.
21. WHO: ICO Centre on HPV and Cancer (HPV Information Centre). Human Papillomavirus and Related Diseases Report. 2015.
22. Gessesse Z, Tadesse Z, Alemayehu M, Hiruye A, Getachew Y, Derbew 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; Suppl 2:17-24.
23. Ruland R, Prugger C, Schiffer R, Regidor M, Lellé RJ. Prevalence of human papilloma virus infection in women in rural Ethiopia. *Eur J Epidemiol*. 2006; 21(9):727-9.
24. Birhanu Z, Abdissa A, Belachew T, Deribew A, Segni H, Tsu V *et al*. Health seeking behavior for cervical cancer in Ethiopia: a qualitative study. *Int J Equity Health*. 2012;11:83. doi: 10.1186/1475-9276-11-83.