



# Knowledge, Attitude, and Practice on Cervical Cancer Screening and Associated Factors Among Women Aged 15–49 Years in Adigrat Town, Northern Ethiopia, 2019: A Community-Based Cross-Sectional Study

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**Background:** Cervical cancer, mainly attributed to persistent infection with a high-risk oncogenic human papillomavirus (HPV), is one of the most common types of women's cancer globally, with more than 90% of new cases occurring in developing and resource-limited countries. In Ethiopia, cervical cancer ranks as the most frequent cancer among women and cause for 4732 deaths annually.

**Objective:** To assess knowledge, attitude, practice towards screening on cervical cancer and associated factors among women aged 15–49 years in Adigrat town, northern Tigray Ethiopia.

**Methods:** A community based quantitative study design was conducted among 617 samples in Adigrat town, northern Tigray Ethiopia. Data were collected using a structured, semi-structured, and pre-tested questionnaire. Associations between dependent and independent variables were tested using logistic regression with the assumptions of p-values <0.05 and confidence interval 95% and considered to be statistically significant.

**Results:** This study indicated that 46.4%, 53.3%, 38.1% of participants had knowledge, positive attitude, and screened on cervical cancer, respectively. Diploma and above [AOR=3.7, 95% CI (1.443, 9.433)] were significant factors associated with knowledge of cervical cancer screening utilization. Primary school (1–8) [AOR=2.7, 95% CI (1.297, 5.699)], greater than 500 ETB household income [AOR = 4.8, 95% CI (2.783, 8.577)] were significant factors associated with attitude of cervical cancer screening utilization. Secondary school (9–12) [AOR = 3.4, 95% CI (1.565, 7.458)], not knowledgeable of cervical cancer [AOR = 1.8, 95% CI (1.156, 2.698)] were significant factors associated with practice of cervical cancer screening utilization.

**Conclusion:** Factors like age, educational status, anyone knowing with cervical cancer and ever received cancer information had a significant association with knowledge of cervical cancer screening utilization. Educational status and perceived income of the household had a significant association with an attitude of cervical cancer screening utilization. Educational status perceived income of the household, anyone knowing with cervical cancer, ever received cancer information, and knowledge of cervical cancer screening utilization were predictors of cervical cancer screening practice.

**Keywords:** cancer, knowledge, attitude, practice, screening, Ethiopia

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## Background

Cancer of the cervix, mainly attributed to persistent infection with a high-risk oncogenic Human papilloma-virus (HPV), is one of the most common types of women's cancer globally, with more than 90% of new cases occurring in developing and resource-limited countries.<sup>1-3</sup>

It is also associated with a higher rate of mortality with over 150,000 global mortality reported only in 2012, of which 87% of death occurred in developing countries.<sup>1,2</sup> Cervical cancer is the second most common malignancy and accounts for the greatest number of deaths from cancer in women worldwide.<sup>4</sup>

It causes 530,000 new cases and 280,000 deaths annually in adult women, of which 88% occur in low-income countries where access to pre-cancer screening and treatment is limited.<sup>5,6</sup> The incidence and mortality in sub-Saharan Africa are among the highest in the world and accounts for over 70% of the global cervical cancer burden with 70,000 new cases annually.<sup>7,8</sup>

In Ethiopia, cervical cancer ranks as the most frequent cancer among women and cause for 4732 deaths annually.<sup>9-11</sup> Among the general population, ~33.6% of women are estimated to harbor cervical human papilloma-virus (HPV) infection at a given time.<sup>12,13</sup>

In many low-income countries, it was the most common female cancer, there were 572,624 new cases of cervical cancer and there were an estimated 265,672 deaths from cervical cancer worldwide accounting for 7.5% of all female cancer deaths. Mortality from cervical cancer varies 18-fold between the different regions of the world with about 87% of cervical cancer deaths occurring in the less developed regions.<sup>5</sup>

Currently, it is seen that the countries with the highest burden of cervical cancer are those not able to implement HPV vaccination due to its high costs and also effective screening practices due to lack of infrastructure, expertise, and so on.<sup>6</sup>

Cervical cancer is disproportionately high in developing countries, amounting to 86% and 88% of worldwide cases and deaths respectively.<sup>9</sup> Besides, when cervical cancer is detected, women in developing countries often present with an advanced case that is not treatable.<sup>8</sup> Overall, a proportional prevalence rate of cervical cancer was 52%, and cervical cancer was responsible for 275,000 deaths in 2008, about 88% of which occur in developing countries: 53,000 in Africa, 31,700 in Latin America and the Caribbean, and 159,800 in Asia.<sup>14</sup>

In Ethiopia, according to population-based cancer registry result from Addis Ababa, cervical cancer ranks as the second in its incidence among women and cause of 4732 deaths annually.<sup>15-18</sup> Among the general population, 33.6% of women are estimated to harbor cervical human papillomavirus (HPV) infection at a given time.<sup>19,20</sup>

A study conducted in Finote Selam town, northwest Ethiopia, Nearly one third, 30.3% of the women knew about cervical cancer, and 58.1% had a favorable attitude towards cervical cancer screening.<sup>21</sup>

In the study conducted in Hossana Town, Hadiya zone, Southern Ethiopia, the proportion of health-seeking behavior for cervical cancer among the study participants was only 83 (14.2%). Of which, 76 (91.6%), of the participants who showed health-seeking behavior did so because other people recommended the service for them before the survey.<sup>22</sup> In another study conducted in North West, Ethiopia 495 (78.7%), of them had heard about cervical cancer, and only 195 (31%) of them were knowledgeable about the disease.<sup>23</sup>

Despite this fact, very few women receive cervical cancer screening services in Ethiopia.<sup>15-17,23</sup>

Cervical cancer screening has been consistently shown to be effective in reducing the incidence rate or the occurrence of new cervical cancer cases and mortality from cervical cancer.<sup>20</sup>

Perhaps, cervical cancer screening facilities are limited because of poor infrastructure, staff, poor knowledge about cervical cancer, and illiteracy; the uptake of cervical cancer screening is poor among women who live in the places where the screening facilities are available.<sup>15-18,20,23-27</sup>

Challenges of cervical cancer screening in developing countries include limited access to health services and laboratories, no screening programs, limited or nonexistent awareness among populations and health workers, and poor referral and follow up.<sup>20,23,27-29</sup>

Despite the decreasing number of cervical cancer cases in Ethiopia, still, there is low knowledge about cervical cancer and poor attitude towards its screening. Programs targeting on increasing the knowledge and screening practice of women are crucial. Information about the level of knowledge, the risk factors, and screening behavior of the study subjects is paramount to provide targeted intervention. However, Information about knowledge and attitude towards screening of cervical cancer is limited in the country; particularly the study area. Thus, the findings from this study will provide the necessary information to fill this gap particularly for the primary care system strengthening to tackle this growing public health problem.

The study was moreover, helps policymakers and programmers to strengthen the existing screening programs in the country to improve the lives of the women by providing information about the level of knowledge, attitude, and practice on cervical cancer screening. Besides, the study gave insight and serve as baseline data for researchers and planning of another intervention plan like; health education and promotion regarding cervical cancer care activities.

## Methods

### Study Area

This study was conducted at Adigrat town which is located at 115 Km of the capital city of Tigray, and 889 Km far from Addis Ababa. Adigrat town has a total population of 97, 742 of whom 46,121 are male, 51,621 female, and 22,872 reproductive age women (15–49) years respectively. The town has with latitude of: 142,769 (1416'36.840"N), longitude: 39, 4608 (3927'38.880"E) and altitude: 2421m. According to 2011/2018 woreda health office information, Adigrat town has six kebeles (smallest administrative units) and several small 'ketena, s with 22,214 numbers of households in the town. The town has one public General hospital, two health centers, and four private clinics.<sup>30</sup>

### Study Design and Period

A community-based cross-sectional study was conducted from February 28 to June 30, 2019.

### Source Population

The source population was all women aged 15–49 years living in Adigrat town.

### Study Population

The study population was all women aged 15–49 years living in Adigrat town randomly selected kebeles.

### Eligibility Criteria

#### Inclusion Criteria

All women aged 15–49 years living in Adigrat town at least for six months.

#### Exclusion Criteria

Women aged 15–49 years living in Adigrat town, which was too ill or not consenting to participate will be exempted from the study.

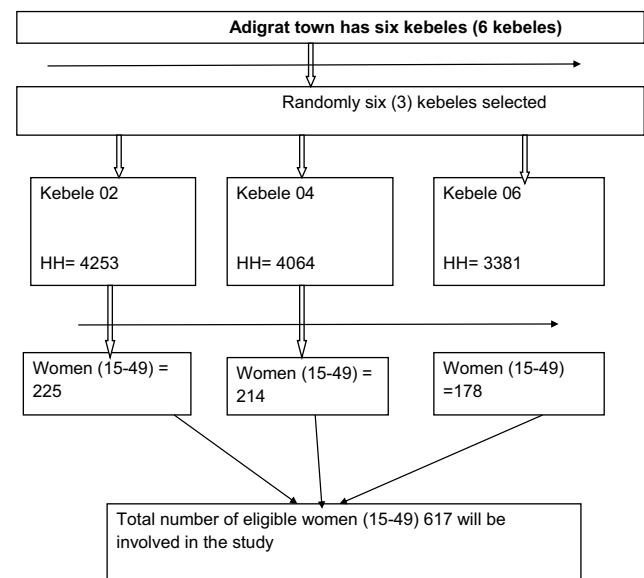
## Sampling Technique and Sample Size Determination

The sample required for the study was conducted using a formula for a single population proportion with the prevalence of knowledge about cervical cancer screening 30.3%, and attitude towards screening of cervical cancer 58.1%,<sup>21</sup> with 95% confidence interval, and 5% margin of error. Since the highest proportion was the attitude towards screening cervical cancer, taking prevalence of 58.1%, the required sample size was 374. After adding a 10% non-response rate and multiplying with a design effect of 1.5, then the final sample size was 617.

A multi-stage sampling technique was used. From the six kebeles, three kebeles were selected using a simple random sampling technique, the three randomly selected kebeles contains 11,698 households and 12,045 women (15–49) years. Finally, the households selected using a systematic random sampling technique by taking every 3rd household interval. In cases where there is more than one eligible women (15–49) year in the same house, a lottery method was applied to pick one woman. The number of eligible reproductive women (15–49) years from each study kebeles was selected based on proportional allocation to sample size (Figure 1).

### Data Collection Instrument

A structured and pre-tested questionnaire was used for data collection. The questionnaire was first prepared in English



**Figure 1** Schematic presentation of the sampling procedure of this study. **Abbreviation:** HH, household.

and then translated into Tigrigna and back-translated into English by different qualified individuals to check the consistency. The training was given for data collectors and supervisors. Women were interviewed by six trained midwifery/nurses that deliver reproductive health service at the time of data collection, data collectors using face to face interview technique. Besides, trained supervisors who have a master of public health (MPH) level professionals and principal investigators were supervised the work.

## Study Variables

### Dependent Variable

- Knowledge of cervical cancer screening.
- Attitude towards its cervical cancer screening.
- Practice towards its cervical cancer screening.

### Independent Variables

- Socio-demographic status: age, educational status, occupation, religion, family perceived income status, marital status, ethnicity, number of children.
- Reproductive history includes parity, age at the start of sexual intercourse, age at marriage, previous screened cervical cancer, time since last screening, result of the last screen for cervical cancer, ever history of pelvic infection, ever history of the sexually transmitted disease (STD), ever history of STD in sexual partner, ever human immunodeficiency virus (HIV) test, HIV status, history of abortion, multiple sexual partners, cause of cervical cancer, symptoms, treatment options, prevention method, reasons for not being screened and oral contraceptive use.
- Other factors are included knowing someone with cervical cancer, source of information about cervical cancer, knowledge of cervical cancer, ever history of smoke.

## Operational Definition

Cervix: an opening of the uterus.

Cancer screening: a procedure that is performed to identify the presence of an abnormal cell in a particular tissue.

Knowledgeable of cervical cancer screening: those respondents who were scored mean and the above mean of the cervical cancer screening knowledge assessing questions.

Not knowledgeable of cervical cancer screening: those respondents who scored below the mean of the cervical cancer screening knowledge assessing questions.

Attitude: opinion, way of thinking behavior reflecting about cervical cancer screening.

Attitude: will be assessed by questions on Likert's scale. And the mean score was calculated to use as a cut point.

Positive attitude: refers to for those scored the mean and above mean.

Negative attitude: refers to those scored below the mean.

Practice: those respondents who screen for cervical cancer at least once.

Not practice: those respondents who screen for cervical cancer at more than once.

## Data Collection Tools and Procedures

A structured and pre-tested questionnaire was used for data collection. The questionnaire was first prepared in English and then translated into Tigrigna and back-translated into English by different qualified individuals to check the consistency. The training was given for data collectors and supervisors. Women were interviewed by six trained midwiferies/nurses that deliver reproductive health service at the time of data collection, data collectors using face to face interview technique. Also, trained supervisors who have MPH level professionals and principal investigators were supervised the work.

## Data Collection Tools and Quality Controls

To achieve good data quality:

- The questionnaire was prepared in English and translated into Tigrigna and back-translated to English to keep the consistency of the data.
- A structured questionnaire that is adapted from different literature is used.
- The training was provided to the selected data collectors and supervisors for three days about the objective and process of data collection, including pre-testing. If there were problems in the questionnaire explanation was provided.
- Pre-testing was done with 5% of the questionnaires, in a similar area that is not included in the study.

## Data Analysis

- The collected data were entered, edited, and cleaned in Microsoft excel window 2007 and then it was

exported to STATA Version 11 for analysis. After the data is preprocessed then descriptive statistics of the study variables were presented using frequencies and percentages for the categorical variables. The presence of an association between knowledge of cervical cancer, attitude, and practice to its screening and the independent variables was tested using cross-tabulation with the chi-square test at P-value < 0.05 significance level.

- As the dependent variable cervical cancer is with two categories, binary logistic regression analysis was used. In the bivariate logistic regression, the level of significance of the association between the dependent and each independent variable was considered at P-value < 0.05, and the factors with this level of significance were made to pass on to the next level of analysis. In the multivariable logistic regression analysis, the Stepwise forward predictor inclusion method was used to develop the main-effect model for the dependent variable cervical cancer. The presence and significance of interaction terms and confounding effects on the main effect model were checked using the Log-likelihood ratio test and the percentage change in beta values of the independent variables.
- Multi-collinearity between independent variables also checked using variance inflation factors considering multi-co linearity at variance inflation factor (VIF) >10. The presence and influence of outliers were checked using residuals cooks distance and influence statistic. A comparison between models was made using the log-likelihood ratio test. The goodness of fit of the model was checked using the Hosmer Lemeshow test of goodness of fit. The proportion of correctly classified observations was checked using the classification table, and the prediction power of the model was checked using the area under the receiver operating characteristics (ROC) curve.

## Ethical Consideration

Ethical approval was obtained from the ethical review committee of Adigrat University and the Tigray Regional Health Bureau, which was confirmed to the principles embodied in the Declaration of Helsinki. Official permission was also obtained from the principals of the health facilities before approaching the study participants. The objective and purpose of the study were clearly explained

to the study subjects to obtain written informed consent before data collection. Participants were also informed that they can discontinue or decline to participate in the study at any time. Confidentiality of the information was maintained and the data were recorded anonymously throughout the study.

## Dissemination of Study Findings

The findings will present to Adigrat University and Tigray Regional Health Bureau (TRHB). The result will be disseminated and communicated to relevant bodies including the study town health office, in addition to this TRHB and different related organizations. The result will be presented in different related seminars or workshops, and in the end, after a lot of effort will be sending for the publication.

## Expected Outputs

-Knowledge of cervical cancer was assessed.

-Attitude towards its screening cervical cancer was identified.

-Practice towards its screening of cervical cancer was identified.

-Factors of cervical cancer were assessed.

-The result was announced to concerned governmental and non-governmental organizations working on maternal health care particularly cervical cancer.

## Result

### Socio-Demographic Characteristics of the Study Subjects

A total of 612 women participated in the study with a response rate of 99.2%. The age distribution of the respondents showed that 274 (44.8%) and 232 (37.9%) were Less than 29 years and 29 up to 39 years of age respectively. The mean age of participants was 31.3±8.0 SD years, with a minimum of 15 and a maximum of 49 years. About 541 (88.4%) of the study subjects were orthodox Christian followers, 41 (6.7%) were catholic and 30 (4.9%) Muslim. More than half of the study subjects were 376 (61.4%) married and 236 (38.6%) were single.

Concerning their educational status 243 (39.7%) and were secondary schooling whereas 203 (33.2%) were primary schooling and 117 (19.1%) college diploma and above. More than half of the study participants 365 (59.6%) and 247 (40.4%) were unemployed and employed respectively. More than half of the study subjects have household



monthly income of less than 200 and Greater than 500 Ethiopian birr were 99 (16.2) and 459 (75.0%) (Table 1).

## Knowledge of Cervical Cancer Screening Utilization Service

More than half of the respondents have heard about cancer and cervical cancer screening 487 (79.6%) and 432 (70.6%) respectively. Having multiple sexual partners 373 (37.3%), sexual transmitted disease 237 (38.7%), early age marriage 195 (31.9%), prolonged oral contraceptive use 118 (19.3% and early sexual intercourse 99

**Table 1** Socio-Demographic Characteristics of Reproductive Age (15–49) Years Women on Cervical Cancer in Adigrat Town Eastern Zone, Tigray, Ethiopia, November 2019

Variables	Categories	Frequency (%)
Age of respondents	Less than 29 years	274(44.8)
	29 up to 39 years	232(37.9)
	Greater than 40 years	106(17.3)
Religion of respondents	Catholic	41(6.7)
	Muslim	30(4.9)
	Orthodox	541(88.4)
Ethnicity of respondents	Tigran	576(94.1)
	Erob	36(5.9)
Marital status of respondents	Married	376 (61.4)
	Single	236(38.6)
Educational status of respondents	Illiterate	49(8.0)
	Primary(1–8)	203(33.2)
	Secondary (9–12)	243(39.7)
	Diploma and above	117(19.1)
Husband Educational status (450)	Illiterate	16 (2.6)
	Primary(1–8)	127 (20.8)
	Secondary (9–12)	160 (26.1)
	Diploma and above	147 (24.0)
Occupational status of respondents	Employed	247 (40.4)
	Unemployed	365 (59.6)
Husband occupational status (450)	Employed	335 (54.7)
	Unemployed	115 (18.8)
Household family	0 up to 4 family size	404 (66.0)
	Greater than 4 family size	208(34.0)
Household perceived Monthly income	Less than 200 ETB	99(16.2)
	200 up to 500 ETB	54(8.8)
	Greater than 500 ETB	459 (75.0)

(15.8%) were risk factors of cervical cancer mentioned by the respondents. About signs and symptoms of cervical cancer mentioned by the respondents were; vulvar itching or burning sensation 306 (50.0%), abnormal vaginal discharge 156 (25.5%), bleeding or pain after sexual intercourse 153 (25.0%), pelvic/back or leg pain 130 (21.2%), excessive vaginal discharge 105 (17.2%) and post-menopausal bleeding 103 (16.8%). Concerning the prevention of cervical cancer were cervical cancer screening 273 (44.6%), reduce the number of sexual partners 340 (55.6%), being faithful to partner 221 (36.1%). Regarding treatment; the respondents mentioned radiation therapy 98 (16.0%), surgery 73 (11.9%), chemotherapy 191 (31.2%) and do not know 328 (53.6%) respectively as treatment options.

The overall knowledge of respondents 284 (46.4%) and 328 (53.6%) were knowledgeable and not knowledgeable about cervical cancer screening utilization service respectively (Table 2). The frequency of cervical cancer screening; more than half and once every year were 68.14% and 21.08% respectively (Figure 2). Source of information about cervical cancer screening; the figure below depicts from media and health workers were 347 (56.7%) and 246 (40.3%) respectively (Figure 3).

## The Attitude of Cervical Cancer Screening Utilization Service

Of the respondents, 225 (36.8%) due to a healthy, screening of cervical cancer was not agreed upon. About 334 (54.6%) and 398 (65.0%) of participants' HPV infection and HIV/AIDS were agreed on the major risk factor for the development of cervical cancer respectively. Using birth control pills for a long time and any reproductive age woman 205 (33.5%) and 254 (41.5%) were susceptible to develop cervical cancer. Cervical cancer can be severe and may be hazardous and precancerous cervical cancer screening may be beneficial 559 (91.3%) and 565 (92.3%) were agreed. In general 326 (53.3%) of the respondents have a positive attitude towards screening for cervical cancer, while the rest 286 (46.7%) have a negative attitude towards screening for cervical cancer (Table 3).

## The Practice of Cervical Cancer Screening Utilization Service

The practice of respondents towards screening for cervical cancer from the total study population was only 233 (38.1%) have been screened for Cervical Cancer. The rest had not been screened.

**Table 2** Knowledge of Respondents About Risk Factors, Signs and Symptoms, and Methods of Prevention and Treatment of Cervical Cancer in Adigrat Town, Eastern, Tigray, Ethiopia, November 2019

Variables	Categories	Frequency (%)
Anyone cervical cancer	Yes	87(14.2)
	No	525(85.8)
Family history of CC	Yes	31(5.1)
	No	581(94.9)
Ever received information about cancer	Yes	487(79.6)
	No	125(20.4)
Ever received information about CC screening	Yes	432(70.6)
	No	180(29.4)
Risk factors mentioned by respondents		
Prolonged use of oral contraceptive	Yes	118(19.3)
	No	494(80.7)
Early age marriage	Yes	195(31.9)
	No	417(68.1)
Age at first pregnancy	Yes	21(3.4)
	No	591(96.6)
Sexually transmitted infection	Yes	237(38.7)
	No	375(61.3)
Early-onset sexual activity	Yes	97(15.8)
	No	515(84.2)
Smoking	Yes	69(11.3)
	No	543(88.7)
Alcohol drinking	Yes	45(7.4)
	No	567(92.6)
Multiple sexual partners	Yes	37.3(37.3)
	No	62.7(62.7)
Having many children	Yes	17(2.8)
	No	595(97.2)
Number of abortion	Yes	80(13.1)
	No	532(86.9)
Aged 30–65 years	Yes	8(1.3)
	No	604(98.7)
Signs and symptoms of cervical cancer mentioned by respondents		
Bleeding or pain after sexual intercourse	Yes	153(25)
	No	459(75.0)
Vulvar itching or burning sensation	Yes	306 (50.0)
	No	306 (50.0)

(Continued)

**Table 2** (Continued).

Variables	Categories	Frequency (%)
Post-menopausal bleeding	Yes	103(16.8)
	No	509 (83.2)
Excessive vaginal discharge	Yes	105 (17.2)
	No	507(82.8)
Abnormal vaginal discharge	Yes	156(25.5)
	No	456 (74.5)
Inter-menstrual bleeding	Yes	93 (15.2)
	No	519(84.8)
Longer or heavier menstrual periods	Yes	38(6.2)
	No	574(93.8)
Pelvic, back, or leg pain	Yes	130 (21.2)
	No	482 (78.8)
Urinary frequency	Yes	79 (12.9)
	No	533 (87.1)
Prevention and treatment		
Cervical cancer screening	Yes	273 (44.6)
	No	339 (55.4)
Reduce numbers of sexual partners	Yes	340 (55.6)
	No	272 (44.4)
Vaccine for HPV	Yes	84 (13.7)
	No	528 (86.3)
Delaying sexual debut	Yes	46 (7.5)
	No	566 (92.5)
Being faithful to a partner	Yes	221 (36.1)
	No	391 (63.9)
Late marriage and late childbirth	Yes	11 (1.8)
	No	601 (98.2)
Avoid having too many children	Yes	52 (8.5)
	No	560 (91.5)
No smoking	Yes	3(0.5)
	No	609(99.5)
Consistent condom use	Yes	3(0.5)
	No	609(99.5)
Do not know	Yes	64 (10.5)
	No	548 (89.5)
Radiation therapy	Yes	98 (16.0)
	No	514 (84.0)
Surgery	Yes	73 (11.9)
	No	539 (88.1)

(Continued)

**Table 2** (Continued).

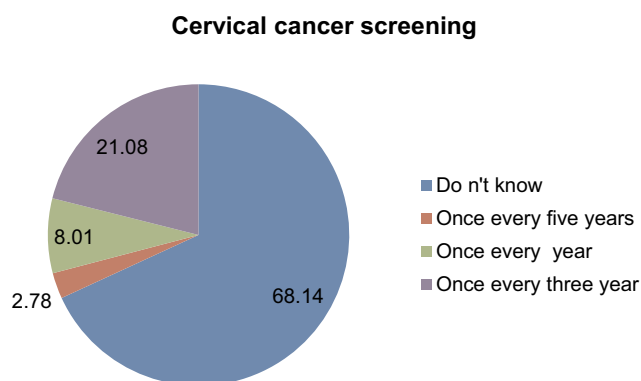
Variables	Categories	Frequency (%)
Chemotherapy	Yes	191 (31.2)
	No	421 (68.8)
Herbal remedies	Yes	13 (2.1)
	No	599 (97.9)
Do not know	Yes	328 (53.6)
	No	284 (46.4)
Overall knowledge of cc screening utilization	Knowledgeable cc screening utilization	284(46.4)
	Not knowledgeable cc screening utilization	328(53.6)

**Abbreviation:** cc, cervical cancer.

Concerning reproductive health screening such as HIV/STI 471 (77.0%) was screened and 64 (10.5%) screened for cancer of the cervix. Women 25 and above years 317 (51.8%) and prostitute women 195 (31.9%) were screened for cervical cancer. About 466 (76.1%) respondents were willing to be screened shortly (Table 4).

### Factors Associated with Women's Reproductive Age (15–49) Years Knowledge on Cervical Cancer Screening

The bivariate analysis showed that variables, such as age, religion, education, occupation, and household family size, monthly perceived income, knowing anyone who had cervical cancer, family history of cervical cancer, and ever heard about cancer were significantly associated with the knowledge score of cervical cancer screening at P-value of less than 0.05.



**Figure 2** Frequency of cervical cancer screening among 15–49 years in Adigrat town, Eastern zonal Tigray, Ethiopia, 2019.

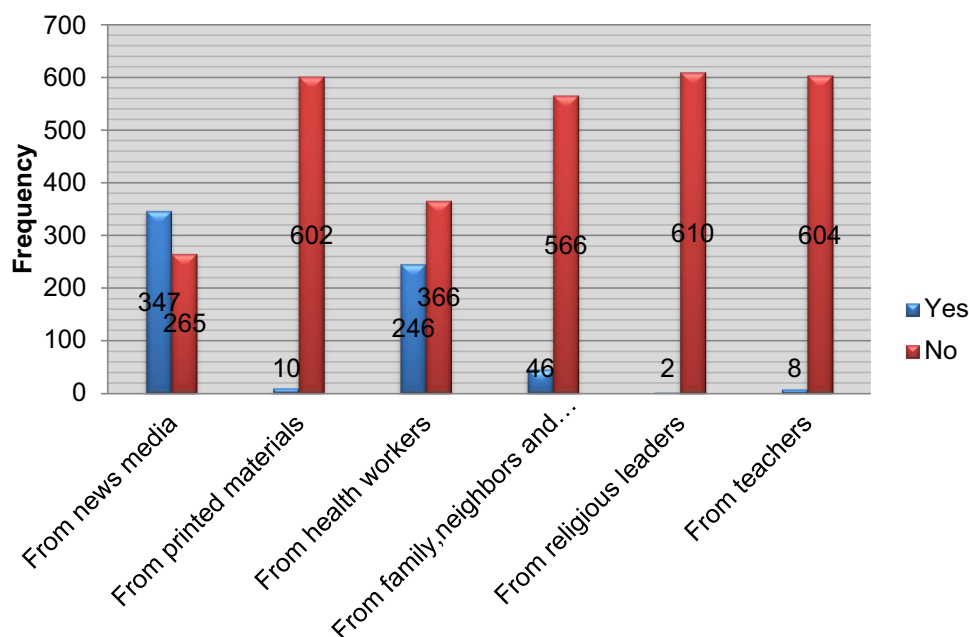
In the multivariable analysis, age, educational status, knowing someone with cervical cancer, and ever received cancer information remained a significant association with the screening of cervical cancer. Participants with the age of greater than 40 years were about 60%, (AOR = 0.4, 95% CI: 0.204, 0.704) to be knowledgeable on cervical cancer screening compared with less than 29 years when controlling the other variables, respondents who attended diploma and above school were nearly four times (AOR = 3.7, 95% CI: 1.443, 9.433) more likely to be knowledgeable on cervical cancer screening than those who are illiterate with controlling the other variables.

Respondents knowing anyone who had cervical cancer were about to 86%, (AOR = 0.14, 95% CI: 0.065, 0.304) to be knowledgeable on cervical cancer screening than those who did not know anyone with cervical cancer controlling the other variables. In the present study, women who had ever received cancer information were 60%, (AOR = 0.4, 95% CI: 0.233, 0.593) knowledgeable on cervical cancer screening than those who did not ever receive cancer information when controlling the other variables (Table 5).

### Factors Associated with Women's Reproductive Age (15–49) Years Attitude on Cervical Cancer Screening

According to the bivariate analysis, the educational status of respondents, willing to screen near the future, and perceived household monthly income was significantly associated with attitude to cervical cancer screening at a P-value of less than 0.05. In the multivariable analysis, three variables, such as educational status and perceived household monthly income became significant with the attitude towards cervical cancer screening at a P-value of less than 0.05. Participants who attended primary, secondary and diploma and above schooling were 2.7, 2.6 and 2.9 times [(AOR = 2.7, 95% CI: 1.29, 5.9), AOR = 2.6, 95% CI: 1.25, 5.45) and AOR = 2.9, 95% CI: 1.32, 6.49)] more likely to have a positive attitude towards cervical cancer screening utilization than those who are illiterate in education when controlling the other variables and participants perceived monthly income 200 up to 500 ET and greater than 500 ETB were five and four times [(AOR = 5, 95% CI: 2.51, 11.47) and (AOR = 4.8, 95% CI: 2.78, 8.58)] more likely to have a positive attitude towards cervical cancer screening utilization comparing with respondents have monthly income less than 200 ETB when controlling the other variables (Table 6).





**Figure 3** Source of information about cervical cancer screening on women 15–49 years in Adigrat Town Eastern zone Tigray, Ethiopia, 2019.

### Factors Associated with Women's Reproductive Age (15–49) Years Practiced on Cervical Cancer Screening

According to the bivariate analysis, educational status of respondents, occupational status of respondents, perceived household monthly income, knowing anyone with cervical cancer, family history of cervical cancer, ever received information about cervical cancer screening, and knowledge of cervical cancer screening utilization were significantly associated with screened practice to cervical cancer screening at P-value of less than 0.05. In the multivariable analysis, five variables, such as educational status, perceived household monthly income, knowing anyone with cervical cancer, ever received information about cervical cancer screening, and knowledge of cervical cancer screening became significant with practice towards cervical cancer screening at a P-value of less than 0.05.

Participants who attended primary, secondary and diploma and above schooling were 5, 4 and 3 times [(AOR = 4.9, 95% CI: 2.24, 10.89), AOR = 3.4, 95% CI: 1.57, 7.46] and AOR = 3.2, 95% CI: 1.34, 7.61] more likely to have a practiced towards cervical cancer screening utilization than those who are illiterate in education when controlling the other variables. Regarding perceived household monthly income 200 up to 500 ETB and greater than 500 ETB were two times [(AOR = 2.3, 95% CI: 1.09, 5.04) and (AOR = 2.2, 95% CI: 1.37, 3.60)] more

likely to have a practiced towards cervical cancer screening utilization comparing with respondents have monthly income less than 200 ETB controlling the other variables. Respondents not knowing anyone with cervical cancer and not ever received information about cervical cancer screening were 60% [(AOR = 0.4, 95% CI: 0.17, 0.75), (0.4, 95% CI: 0.24, 0.68)] less likely to have a practiced towards cervical cancer screening utilization comparing with respondents knowing anyone with cervical cancer and ever received information about cervical cancer screening when controlling the other variables. Concerning knowledge of cervical cancer screening utilization respondents being knowledgeable almost two times (AOR = 1.8, 95% CI: 1.16, 2.69) more likely to have a practice towards cervical cancer screening utilization comparing with respondents not knowledgeable when controlling the other variables (Table 7).

### Discussion

Knowledge of cervical cancer screening, attitude towards its screening, and practice of screening are essential for the prevention of the disease cervical cancer.

The current study was conducted to determine women's (15–49 years) knowledge, attitude, and practice towards cervical cancer screening and associated factors.

The current study indicated that 46.4%, 53.3%, 38.1%, of participants had knowledge, a positive attitude, and screened on cervical cancer respectively. The current

**Table 3** Attitude of Respondents on Cervical Cancer Screening Utilization in Adigrat Town, Eastern, Tigray, Ethiopia, November 2019

Variables	Categories	Frequency (%)
Feeling shy to have cervical screening	Disagree	553(90.4)
	Agree	46(7.5)
	Do not know	13(2.1)
Cultural belief prevented me from having cc screening	Disagree	561(91.7)
	Agree	38(6.2)
	Do not know	13(2.1)
I am a virgin and I do not need cc screening	Disagree	477(77.9)
	Agree	105(17.2)
	Do not know	30(4.9)
I am healthy and I do not need cervical cancer screening	Disagree	356(58.2)
	Agree	225(36.8)
	Do not know	31(5.1)
HPV infection is the major risk factor for the development of cervical cancer	Disagree	59(9.6)
	Agree	334(54.6)
	Do not know	219(35.8)
HIV (the virus that causes AIDS) can increase the risk of developing cervical cancer	Disagree	73(11.9)
	Agree	398(65.0)
	Do not know	141(23.0)
Smoking can increase the risk of developing cervical cancer	Disagree	80(13.1)
	Agree	416(68.0)
	Do not know	116(19.0)
Having given birth to three or more children can increase the risk of developing cervical cancer	Disagree	281(45.9)
	Agree	112(18.3)
	Do not know	219(35.8)
Using birth control pills for a long time (five or more years) can increase the risk of developing cervical cancer	Disagree	217(35.5)
	Agree	205(33.5)
	Do not know	190(31.0)
Possible signs of cervical cancer include vaginal bleeding and pelvic pain	Disagree	87(14.2)
	Agree	382(62.4)
	Do not know	143(23.4)
Lack of health service facility in my area prevented me from having cc screening	Disagree	477(77.9)
	Agree	82(13.4)
	Do not know	53(8.7)
Bad attitude toward doctors/nurses/ midwifery prevented me from having cervical cancer screening	Disagree	565(92.3)
	Agree	12(2.0)
	Do not know	35(5.7)
Cervical cancer screening is painful	Disagree	505(82.5)
	Agree	30(4.9)
	Do not know	77(12.6)
I could not afford the cost of having cc screening	Disagree	433(70.8)
	Agree	54(8.8)
	Do not know	125(20.4)

(Continued)

**Table 3** (Continued).

Variables	Categories	Frequency (%)
Any reproductive age woman is susceptible to develop cervical cancer	Disagree	293(47.9)
	Agree	254(41.5)
	Do not know	65(10.6)
Like any women, I am susceptible to develop cervical cancer	Disagree	266(43.5)
	Agree	306(50.0)
	Do not know	40(6.5)
Cervical cancer can be severe and may be hazardous	Disagree	30(4.9)
	Agree	559(91.3)
	Do not know	23(3.8)
Precancerous cervical cancer screening may be beneficial to my wellbeing	Disagree	25(4.1)
	Agree	565(92.3)
	Do not know	22(3.6)
Overall Attitude of cc screening utilization	Positive Attitude	326(53.3)
	Negative Attitude	286(46.7)

study showed that knowledge of study participants was 46.4%. This finding is higher than the findings were comparable with that of a community-based study conducted in Finote Selam town, in Gondar, reported from Addis Ababa, in North West Ethiopia and female students of Mizan Tepi University, Ethiopia, 30.3%, 31%, 25%, 31%, 33.97% respectively.<sup>21,23,31,32</sup> The possible reason for the difference might be that the sample sizes, study period, determine knowledge in the previous study. However, our result is lower than the finding study conducted in Addis Ababa Ethiopia and Uganda, which noted 64.8%, and 55%.<sup>33,34</sup> The possible reason for the difference from the study done in Uganda and Addis Ababa could be the variation in educational status between the two study populations and study setting.

The current study revealed that ever received information about cervical cancer screening was 70.6%. This finding was higher than the findings study conducted in Mizan Tepi University, in Addis Ababa, Ethiopia, and Nigeria 53.11%, 66.7%, and 40.8%,<sup>32,33,35</sup> but lower, when compared with the study done in Gondar, North West Ethiopia which was 78.7% and Ghana, Accra 93.0%.<sup>21,36</sup> The discrepancy may be due to time variation, the differences of study setting, and sample size. Our study showed that 53.3% of the women had a favorable attitude towards cervical cancer screening. This result was better

**Table 4** Respondents on Cervical Cancer Screening Practice in Adigrat Town, Eastern, Tigray, Ethiopia, November 2019

Variables	Categories	Frequency (%)
Have you ever screened for any reproductive health screenings like HIV, STIs	Yes	471(77.0)
	No	141(23.0)
Have you ever screened for cancer of the cervix	Yes	64(10.5)
	No	548(89.5)
Women 25 and above years screened for cervical cancer	Yes	317(51.8)
	No	295(48.2)
Screened of Prostitute for cervical cancer	Yes	195(31.9)
	No	417(68.1)
Do not know	Yes	111(18.1)
	No	501(81.9)
Where did you screen (64)	Governmental Hospital	10(1.6)
	Private Hospital	54(8.8)
	Hospital	
Who was initiated for screening (64)	Offered by Health Professionals	27(4.4)
	Self-initiated	37(6.0)
How many times since you become sexually active (64)	Once	50(8.16)
	More than once	14(2.28)
When was the last time you screened (64)	Within the past three years	49(8.0)
	More than three years ago	15(2.45)
Willing to be screened soon	Yes	466(76.1)
	No	146(23.9)
Overall practice	Screened	233 (38.1)
	Not screened	379 (61.9)

than that of a study done in Dessie Town, Ethiopia which documented 42.1%.<sup>37</sup> The gap between our study and that of Dessie might be the high proportion of single (unmarried) participants in the Dessie study. There is evidence that single women have a less favorable attitude towards cervical cancer screening. However, the result is lower than the finding of a hospital-based study in India which reported 76%.<sup>38</sup> The difference between our study community based and the study in India might be the study setting; hospitalized women might have high health-seeking behavior and better access to information. Our finding was lower than that of a study conducted among

market women in Nigeria noted 80.4% had a favorable attitude towards cervical cancer screening.<sup>39</sup> The difference might be that in the Nigerian study the participants were shop owners/attendants aged 15 years and above, most of them with higher educational status. The current study revealed that 53.3% had a favorable attitude towards cervical cancer screening. This finding was consistent with the study conducted in Addis Ababa, Ethiopia and that Tanzania 50% and 56% of all participants had a favorable attitude towards cervical screening.<sup>33,40</sup> Our finding was also lower than the study conducted in Finote Selam town and Mizan Tepi University, Ethiopia 58.1%, and 61.24% of the respondents had a favorable attitude towards cervical cancer screening for cervical cancer.<sup>21,32</sup>

The current study should that benefits of precancerous cervical cancer screening agreed that 92.3%. This finding was higher than the study conducted in Mizan Tepi University, Ethiopia, and Ghana 44.96% and 87%,<sup>32,36</sup> whereas cervical cancer can be severe and harmful agreed that 91.3%. This is higher than the study conducted in Mizan Tepi University, Ethiopia 44.49%,<sup>32</sup> and lack of susceptibility cervical carcinoma was 36.8%. This finding is lower than the study conducted in Ghana.<sup>36</sup> The discrepancy may be due to time variation, the differences of study setting, study subjects, and sample size. The practice of the current respondents towards screening for cervical cancer was indicated that 38.1% have been screened. This finding is higher than those published in Mizan Tepi University 14.83%, Addis Ababa 6.8%, Ethiopia, Tanzania 14%, and Kenya 22%,<sup>32,40-42</sup> but the current study was lower than the study conducted in Kinshasa, the Democratic Republic Congo 67.9%.<sup>43</sup> The difference might be that in time variation, study design, sample size, and cultural differences. Most of the respondents were not screened, 11.4% believe as they are healthy and 77.6% embarrassment to be screened. The current study of believes as they are healthy lower than the study conducted in Mizan Tepi University 36.84%, whereas 77.6% higher than the previous study 17.7%.<sup>32</sup> The discrepancy may be due to time variation, the differences of study setting, study subjects, and sample size.

In the multivariate logistic regression test variables of respondent's age, educational status, anyone knowing with cervical cancer and ever received cancer information had a significant association with knowledge of cervical cancer screening utilization; at the same time variables of respondent's of educational status and perceived income of the

**Table 5** The Association Between Knowledge of Cervical Cancer Screening Utilization with Different Variables of Women 15–49 Years Age, Adigrat Town, Tigray Regional State Eastern Zone, 2019

Variables	Categories	Knowledge of Cervical Cancer Screening Utilization		95%,CI	
		Knowledgeable (%)	Not Knowledgeable (%)	COR	AOR
Age of respondents	Less than 29 years	104(38.0)	170(62.0)	1.00	1.00
	29 up to 39 years	107(46.1)	125(53.9)	0.7(0.501, 1.019)	0.8(0.532, 1.213)
	Greater than 40 years	73(68.9)	33(31.1)	<b>0.3(0.171, 0.446)</b>	<b>0.4(0.204, 0.704)</b>
Religion of respondents	Catholic	14(34.1)	27(65.9)	1.00	1.00
	Muslim	20(66.7)	10(33.3)	<b>0.3(0.096, 0.702)</b>	0.4(0.145, 1.300)
	Orthodox	250(46.2)	291(53.8)	0.6(0.310, 1.176)	0.9(0.460, 2.017)
Educational status of respondents	Illiterate	39(79.6)	10(20.4)	1.00	1.00
	Primary(1–8)	103(50.7)	100(49.3)	<b>4(1.794, 7.994)</b>	1.9(0.837, 4.435)
	Secondary (9–12)	106(43.6)	137(56.4)	<b>5(2.406, 10.560)</b>	2.3(0.975, 5.439)
	Diploma and above	36(30.8)	81(69.2)	<b>9(3.951, 19.490)</b>	<b>3.7(1.443, 9.433)</b>
Occupation status of respondents	Employed	92(37.2)	155(62.8)	1.00	1.00
	Unemployed	192(52.6)	173(47.4)	<b>0.5(0.385, 0.744)</b>	0.8(0.523, 1.142)
Household family size	0 up to 4 family size	165(40.8)	239(59.2)	1.00	1.00
	Greater than 4 family size	119(57.2)	89(42.8)	<b>0.5(0.368, 0.725)</b>	1.0(0.677, 1.558)
Anyone with cervical cancer	Yes	9(10.3)	78(89.7)	1.00	1.00
	No	275(52.4)	250 (47.6)	<b>0.1(0.052, 0.214)</b>	<b>0.14(0.065, 0.304)</b>
Family history of cervical cancer	Yes	5(16.1)	26(83.9)	1.00	1.00
	No	279(48.0)	302(52.0)	0.2( <b>0.079, 0.550</b> )	0.6(0.198, 2.015)
Ever received information about cancer	Yes	194(39.8)	293(60.2)	1.00	1.00
	No	90(72.0)	35(28.0)	<b>0.3(0.167, 0.396)</b>	<b>0.4(0.233, 0.593)</b>

**Notes:** the bold values under AOR showed that these factors are significant with the knowledge of cervical cancer screening utilization whereas bold values under COR only showed a bivariate association.

**Table 6** The Association Between the Attitude of Cervical Cancer Screening Utilization with Different Variables of Women 15–49 Years Age, Adigrat Town, Tigray Regional State Eastern Zone, 2019

Variables	Categories	The Attitude of Cervical Cancer Screening Utilization		95%,CI	
		Favorable Attitude (%)	Not Favorable Attitude (%)	COR	AOR
Educational status of respondents	Illiterate	36(73.5)	13(26.5)	1.00	1.00
	Primary(1–8)	101(49.8)	102(50.2)	<b>2.8(1.401, 5.583)</b>	<b>2.7(1.297, 5.699)</b>
	Secondary (9–12)	131(53.9)	112(46.1)	<b>2.3(1.196, 4.685)</b>	<b>2.6(1.250, 5.445)</b>
	Diploma and above	58(49.6)	59(50.4)	<b>2.8 (1.357, 5.848)</b>	<b>2.9(1.329, 6.493)</b>
Willing to screened near the future	Yes	236(50.6)	230(49.4)	1.00	1.00
	No	90(61.6)	56(38.4)	<b>0.6(0.437, 0.933)</b>	0.8(0.576, 1.322)
Perceived HH monthly income	Less than 200 ETB	82(82.8)	17(17.2)	1.00	1.00
	200 up to 500 ETB	26(48.1)	28(51.9)	<b>5(2.462, 10.962)</b>	<b>5(2.505, 11.469)</b>
	Greater than 500 ETB	218(47.5)	241(52.5)	<b>5(3.066, 9.275)</b>	<b>4.8(2.783, 8.577)</b>

**Notes:** the bold values under AOR showed that these factors are significant with the attitude of cervical cancer screening utilization whereas bold values under COR only showed a bivariate association.

**Table 7** The Association Between the Practice of Cervical Cancer Screening Utilization with Different Variables of Women 15–49 Years Age, Adigrat Town, Tigray Regional State Eastern Zone, 2019

Variables	Categories	Cervical Cancer Screening		95% CI	
		Screened (%)	Not Screened (%)	COR	AOR
Educational status of respondents	Illiterate	38(77.6)	11(22.4)	1.00	1.00
	Primary(1–8)	66(32.5)	137(67.5)	<b>7(3.447, 14.917)</b>	<b>4.9(2.238,10.885)</b>
	Secondary (9–12)	91(37.4)	152(62.6)	<b>6(2.810, 11.850)</b>	<b>3.4(1.565, 7.458)</b>
	Diploma and above	38(32.5)	79(67.5)	<b>7(3.310, 15.583)</b>	<b>3.2(1.335, 7.607)</b>
Occupation status of respondents	Employed	78(31.6)	169(68.4)	1.00	1.00
	Unemployed	155(42.5)	210(57.5)	<b>0.6(0.445,0 0.878)</b>	0.8(0.556, 1.250)
Perceived HH monthly income	Less than 200 ETB	55(55.6)	44(44.4)	1.00	1.00
	200 up to 500 ETB	20(37.0)	34(63.0)	<b>2(1.077, 4.194)</b>	<b>2.3(1.096, 5.036)</b>
	Greater than 500 ETB	34(34.4)	301(65.6)	<b>2(1.533, 3.700)</b>	<b>2.2(1.367, 3.696)</b>
Anyone with cervical cancer	Yes	11(12.6)	76(87.4)	1.00	1.00
	No	222(42.3)	303(57.7)	<b>0.2(0.103, 0.381)</b>	<b>0.4(0.170, 0.748)</b>
Family history of cervical cancer	Yes	5(16.1)	26(83.9)	1.00	1.00
	No	228(39.2)	353(60.8)	<b>0.3(0.113,0 0.787)</b>	0.9(0.286, 3.031)
Ever received information about cancer	Yes	161(33.1)	326(66.9)	1.00	1.00
	No	72(57.6)	53(42.4)	<b>0.4(0.243, 0.543)</b>	0.9(0.558, 1.598)
Ever received information about cervical cancer screening	Yes	120(27.8)	312(72.2)	1.00	1.00
	No	113(62.8)	67(37.2)	<b>0.2(0.158, 0.330)</b>	<b>0.4(0.241,0.675)</b>
Knowledge of cervical cancer screening utilization	Knowledgeable	152(53.5)	132(46.5)	1.00	1.00
	Not Knowledgeable	81(24.7)	247(75.3)	<b>3.5(2.493, 4.946)</b>	<b>1.8(1.156, 2.698)</b>

**Notes:** the bold values under AOR showed that these factors are significant with the practice of cervical cancer screening utilization whereas bold values under COR only showed a bivariate association.

household had a significant association with an attitude of cervical cancer screening utilization and respondent's educational status, perceived income of the household, anyone knowing with cervical cancer, ever received information about cancer and knowledge of cervical cancer screening utilization were predictors of cervical cancer screening practice.

The present study identified that the participants with the age of 40 years were increased knowledge of cervical cancer screening utilization by 60% than 29 years. Studies conducted in Gondar,<sup>21</sup> Democratic Republic of Congo Kinshasa,<sup>43</sup> and in Mekelle zone<sup>44</sup> had similar findings respondents were 2.2 and 7.6 and 1.8 times more likely to be knowledgeable on cervical cancer screening utilization. Our study revealed that women with an educational status diploma and above were 3.7 times more likely to be knowledgeable about cervical cancer screening. Studies conducted in Gondar, Democratic Republic of Congo Kinshasa, Finote Selam town, and Dessie town<sup>19,21,43,45</sup> had similar findings,

respondents, educational status with cervical cancer were 2.2,7.6,7.2 and 8.7 times more likely to be knowledgeable on cervical cancer screening utilization. Our study revealed that women who knew someone who had cervical cancer were increased screening utilization by 86% than did not know someone with cervical cancer; the previous study was done in Gondar and Bale Zone, Ethiopia<sup>21,46</sup> were 4.9 and 3.4 times more likely to be knowledgeable on cervical cancer screening utilization than those women who do not know someone with cervical cancer and in the current study ever received information on cervical cancer screening was about 60% than those participants who not ever received information on cervical cancer screening. This is similar studies conducted in Gondar, in Hossana Town and<sup>20,21,46</sup> were 8, 2.6, and 3.6 times more likely to be not knowledgeable on cervical cancer screening utilization than those who received information.

Regarding the attitude of participants on cervical cancer screening utilization, the current study showed



educational status primary, secondary, and diploma and above were 2.7, 2.6 and 2.9 times more likely have a favorable attitude on cervical cancer screening utilization than those who participants have not favorable attitude. This is similar to studies conducted in Hossana Town, Hadiya zone, and in India<sup>20,38</sup> were 7.6 and 15.3 times more likely have a favorable attitude on cervical cancer screening utilization and perceived monthly income of participants for those greater than 500 ETB was 4.8 times more likely have a favorable attitude on cervical cancer screening utilization than less than 200 ETB, this is a similar study conducted in India.<sup>38</sup>

Concerning the practice of participants on cervical cancer screening utilization, the current study revealed that educational status primary, secondary and diploma and above were 4.9, 3.4, and 3.2 times more likely have screened for cervical cancer than those who participants illiterate and perceived income 200 to 500 ETB were 2.3 and 2.2 times more likely have the experiences to uptake cervical cancer screening than perceived income less than 200 ETB. This was similar to studies conducted in India, in Addis Ababa and Arba Minch Town<sup>31,38,47</sup> were 3.9, 3.2, and 3.6 times more likely have screened for cervical cancer. Participants who knew someone who had cervical cancer was increased screening utilization by 60% than did not know someone with cervical cancer; this was in line with the study conducted in Addis Ababa<sup>33</sup> and the current study indicated that ever received information on cervical cancer screening was about 60% screened than those participants who did not ever receive information on cervical cancer screening; this is similar with the study conducted in Hadiya zone, south Ethiopia and Kenya were 4.5 and 6.6 times more likely those participants whoever received information on cervical cancer screening were screened.<sup>20,48</sup>

Regarding knowledge of cervical cancer for screened was 1.8 times more likely knowledgeable on screening cervical cancer than those participants not knowledgeable; the current study was in line with a study conducted in Mekelle Town, Hadiya Zone, South Ethiopia, and Northwest Ethiopia were 2.4,11 and 3.0 times more likely knowledgeable on screening cervical cancer practice than not knowledgeable.<sup>20,44,49</sup>

## Conclusion

Factors like age, educational status, anyone knowing with cervical cancer and ever received cancer information had a significant association with knowledge of cervical cancer

screening utilization. Educational status and perceived income of the household had a significant association with an attitude of cervical cancer screening utilization. Educational status perceived income of the household, anyone knowing with cervical cancer, ever received cancer information, and knowledge of cervical cancer screening utilization were predictors of cervical cancer screening practice.

## Recommendation

Based on the findings here are encountered to recommends:

- TRHB and Adigrat zonal health bureau should work at large on women's health especially those who are at their age are at the reproductive and have enough knowledge, attitude, and practice cervical screening before they become ill. Give short and long training hierarchically from regional to district health bureau.

## Abbreviations

AIDS, acquired immunodeficiency virus; AOD, adjusted odds ratio; Cc, cervical cancer; COD, crude odds ratio; ETB, Ethiopian Birr; HH, household; HIV, human immunodeficiency virus; HPV, human papilloma-virus; MPH, master's in public health; ROC, receiver operating characteristic; STD, sexually transmitted disease; STI, sexually transmitted infections; TRHB, Tigray Regional Health Bureau; VIF, variance inflation factor.

## Data Sharing Statement

Data produced or analyzed during this study are included in this published paper. The datasets can be requested to the corresponding author.

## Ethics Approval and Consent to Participate

Ethical clearance was permitted by the Ethical Review Board of Adigrat University, College of Medicine, and Health Sciences with the reference number of Notification of Expedited Approval ERC 1321/2019. Every precaution took to protect the privacy of research subjects and the confidentiality of their personal information. The data collector checked whether the study participants had a relationship or not. Participation by individuals capable of giving informed consent as subjects in this research were voluntary.

Written informed consent was gotten from every participant for 18 years old and above whereas written informed consent was obtained from a parent or guardian for participants 15-17 years old. Participants capable of giving informed consent, each potential subject was adequately informed of the aims, methods, sources of funding, any possible conflicts of interest, and institutional affiliations of the researcher. The potential subject was informed of the right to refuse to participate in the study or to withdraw consent to participate at any time without reprisal. After ensuring that the potential subject understood the information, the data collector appropriately qualified individuals should seek the potential subject's freely-given informed consent, preferably in writing. The collected data did not comprise identifying information, and the collected data were used for this study only.

## Consent for Publication

Consent of publication for this research is Adigrat University, College of Medicine and Health Science, public health department, and participants.

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## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest for this work.

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