

## ORIGINAL RESEARCH OPEN ACCESS

# Assessment of Human Papillomavirus Vaccine Knowledge and Attitudes Among Adolescent School Girls in Debre Berhan City, Ethiopia: A Community-Based Cross-Sectional Study

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## ABSTRACT

**Background and Aims:** Chronic human papillomavirus (HPV) infections are the main cause of cervical carcinoma (CC). It has a significant worldwide disease burden and is the fourth most prevalent malignancy in women. Cervical cancer is the second most common cancer among Ethiopian women, causing an estimated 4884 deaths and 7095 new instances of diagnosis annually. This study aimed to evaluate knowledge and attitudes of HPV vaccine among adolescent school girls.

**Methods:** Between June 2, 2023 and August 15, 2023, a study was conducted in Debre Berhan City. All adolescent girls between the ages of 14 and 18 who attended school in the chosen kebeles were eligible for participation in the current study. Schools were selected using a simple random sampling method. Epidata 4.2.0 was utilized for data entry and SPSS 25 for the analysis. There were three types of logistic regression used: multivariate, univariate, and descriptive statistics. At 95% CI, a *p*-value of less than 0.05 was deemed statistically significant.

**Results:** We had 601 respondents. The majority of the respondents were in the age range of 16–17 years (51.3%). More than one-fourth of participants started sexual activity, (29.5%) and only (22.1%) participants had information about the HPV vaccine. The majority (83%) of participants had poor knowledge about the HPV vaccine. More than half of the participants (57.4%) had no information about CC and only (26.8%) study participants had information about CC. Only (14.5%) of participants knew the cause of CC was HPV. Below one-fourth of (23.4%) participants knew the HPV vaccine used to prevent HPV infection. More than half (54.2%) of the participants had a negative attitude towards the HPV vaccine. Participants who were not informed about the HPV vaccine before the current study were approximately 65% less likely to be aware of the HPV vaccine compared to those who had prior knowledge of it (AOR = 0.65; 95%CI = 0.42,0.92; *p* = 0.003).

**Conclusions:** Adolescent girls had negative attitudes and poor knowledge of the HPV vaccine. Adolescent girls should be educated about CC and HPV infection to improve their knowledge and attitude about the HPV vaccine using health professionals and mass media.

## 1 | Introduction

Human papillomavirus (HPV) infections are the main cause of cervical cancer (CC), which is a malignant epithelial tumor that develops from normal cervical epithelium through the progressive development of low-grade and high-grade cervical intraepithelial lesions [1–3]. It is the fourth most frequent cancer in women and has a significant global health impact [4]. The death rates from CC remain extremely high worldwide, particularly in low- and middle-income nations (LMICs) [4, 5].

In East Africa, CC is estimated to kill 35 out of every 100,000 women and impact 42.7 out of every 100,000 [6]. In Ethiopia, CC is the second most frequent malignancy among women, accounting for an estimated 4884 deaths each year and 7095 new cases of diagnosis [7].

The lack of awareness among the public, healthcare professionals, and policymakers about CC is a major issue in developing countries [8]. Furthermore, there are insufficient screening programs for precursor lesions and early-stage cancer, as well as restricted access to health care [9]. It is estimated that CC illness causes about 3235 fatalities in Ethiopia annually [10].

Screening for CC is done to find any precancerous lesions early on and to find any indications of disease in the cervix before symptoms appear [11]. This early detection greatly increases the likelihood of successful treatment and full recovery, as opposed to more advanced stages of cancer [12]. Education programs and community-based preventative campaigns have been shown to be helpful in raising awareness and increasing access to screening and treatment options [13, 14].

Most CC cases are related to HPV infections, with HPV-16 and 18 being the most carcinogenic subtypes, accounting for over 50% and 10% of cases, respectively [15]. Since the introduction of official screening programs and HPV vaccine campaigns 30 years ago, the incidence and death of CC have fallen by more than half in high-income nations [16].

On December 3, 2018, the bivalent HPV vaccine was introduced in Ethiopia for 14-year-old girls [17]. To reach all 14-year-old females, the vaccine is presently mostly administered through a school-based strategy. However, social influence, ignorance of CC and screening, and a lack of health education regarding the HPV vaccine were obstacles to Ethiopia's effective HPV vaccination campaign [18].

There is a significant chance that the HPV vaccination will shield millions of men and women globally from HPV-related infections [19]. On December 3, 2018, the bivalent HPV vaccine was made available to Ethiopian girls aged 14 years [20]. The vaccine is currently mostly given through a school-based approach to reach all 14-year-old females [21]. Nonetheless, societal influence, and a lack of understanding of CC and testing, and a lack of health awareness of the HPV vaccine were difficulties in a successful HPV vaccination campaign in Ethiopia [22].

A key barrier to immunization is that most teenagers are not aware of the HPV vaccine, according to some studies [23]. Adolescents are not the only ones who are impacted by inadequate

knowledge and negative attitudes [24]. Because most parents believe their child is not at high risk of contracting HPV, they frequently put off getting the vaccine [25, 26]. The respondent's negative views, unfavorable attitudes, and lack of expertise regarding the vaccine combined with the HPV vaccine delivery [27].

Adolescents' attitudes toward the HPV vaccine, their knowledge of it, and other related issues have not been thoroughly investigated in Ethiopia. Thus, the purpose of this study was to assess adolescent girls' knowledge, attitudes, and associated factors related to the HPV vaccine in Debre Berhan City, Ethiopia.

## 2 | Methods

### 2.1 | Study Design, Area, and Period

Between June 2, 2023 and August 15, 2023, a cross-sectional survey was conducted in Debre Berhan City. There are 10 sub-cities in the city for administration. The entire population in 2022–2023 was 188,513, according to the Debre Berhan City Administration. In the city, there were 25 community pharmacies, nine health posts, ten private clinics, three hospitals (two governmental and one private), three health centers, and nine health posts available for public health services.

There are 30 primary schools (grades 1–8) in the city of Debre Berhan, of which 16 are governmental and the remaining 14 are private, according to the local administration's educational bureau. In addition, there are eight secondary schools in the town, out of these two are private secondary schools. 13,977 adolescents in the city are of school age. Out of them, 6928 are men and 7049 are females.

### 2.2 | Population

Adolescent girls from randomly selected schools in Debre Berhan city, aged 14–18 years, participated in this study.

### 2.3 | Eligibility Criteria

All school-going adolescent girls aged 14–18 in the selected kebeles were eligible to participate in the study, and those who chose not to participate were excluded.

### 2.4 | Sample Size Determination

The sample size was determined using a single proportion method based on the following assumptions: a study was conducted in Ethiopia, thus we utilized a 58 percent prevalence [28] of girls' knowledge about HPV vaccine at a 95% confidence interval, a 95% CI, and a 5% margin of error.

$$n = (Z\alpha/2)^2 P(1-P)/d^2 = (1.96)^2 0.58(1-0.58)/(0.05)^2 = 375$$

A total of 601 females were enlisted as study participants after taking into account the design effect of 1.5% and 10% non-respondents.

## 2.5 | Sampling Procedures

The selection of primary and secondary schools was done using a multi-stage sampling technique. Using a straightforward random sampling technique (lottery method), 4 secondary schools and 12 primary schools were chosen. Utilizing the proportionate allocation approach, the final study participants were chosen from each chosen school. A list of students was taken from each selected school. The selection of the school started at the administrative office of Debre Berhan city.

## 2.6 | Variables

Socio-demographic characteristics (age, religion, marital status, family occupation, education level, knowledge of the HPV vaccine, and source of information about the HPV vaccine) were the independent variables, while the dependent variables were the knowledge and attitudes of the girls regarding the HPV vaccine.

## 2.7 | Data Collection Technique

Before the actual data collection in the main study, 5% [31] of study participants at Bruh Tesfa Primary School took a pre-test. Supervisors and data collectors received the 2-day training. Five diploma teachers participated in the data gathering, while one biology bachelor's degree holder oversaw the procedure. Thirteen-item knowledge questions were used to assess the girl's level of knowledge. Participants who answered the questions correctly were given a score of 1, while those who did not get the questions right were given a score of 0. Girl's knowledge was subsequently broken down into two categories: good knowledge (8–13 out of 13 items) and poor knowledge (0–7 out of 13 items) [21]. Its Cronbach's Alpha value was 0.56.

A 12-item attitude questionnaire was also used to gauge the girl's attitude. Participants were classed as having a negative attitude (0–6 out of 12 items) and a positive attitude (7–12 out of 12 items) based on the number of points they gave the question (zero for participants with a negative attitude and one for those with a positive attitude) [21].

## 2.8 | Data Processing and Analysis

Epidata 4.2.0 was utilized for data entry and SPSS 25 for the analysis. There were three types of logistic regression used: multivariate, univariate, and descriptive statistics. At 95% CI, a *p*-value of less than 0.05 was deemed statistically significant.

## 2.9 | Ethical Issues

This study got Institutional Review Board (IRB) ethical clearance from Debre Berhan University's Asrate Weldeyes Health Sciences Campus (IRB/09/21/2023). In addition, informed consent has been obtained from a parent.

## 3 | Results

### 3.1 | Demographic Features of Participants

The majority of the respondents were in the age range of 16–17 years 308 (51.3%). Majority of study participants had a secondary school education level of 319 (53%). Out of the participants' fathers' professions represented, only 289 (48.1%) were governmentally employed, while the remaining 312 individuals (51.9%) had different professions. In the majority of participants' mothers' educational level, 415 (69%) had secondary school and above educational level. Over three-fourths of the participants', 497 (82.7%), places of birth were in urban areas and the majority of the respondents lived with both parents, 467 (77.7%) (Table 1).

More than one-fourth of participants started sexual activity, 177 (29.5%) and only 133 (22.1%) participants had information about the HPV vaccine. The participants' main sources of information were mass media, 68 (51.1%) (Table 1).

### 3.2 | Girl's Knowledge About HPV Vaccine

Most of the participants, 497 (83%), had inadequate knowledge about the HPV vaccine. A large proportion, 345 (57.4%), had no awareness of CC, while only 161 (26.8%) had some knowledge about CC. The majority 313 (52.1%) of participants did not know how to prevent CC in the future HPV vaccine recommendation, but only 87 (14.5%) participants knew the cause of CC is HPV. Below one-fourth of 142 (23.4%) participants knew the HPV vaccine used to prevent HPV infection. Only 57 (9.5%) of participants knew vaccination against HPV is recommended before sexual activity and 108 (18%) participants knew HPV vaccine is given in schools (Table 2).

### 3.3 | Girl's Attitude About the HPV Vaccine

A majority of the participants, specifically 326 individuals (54.2%), expressed a negative stance regarding the HPV vaccine. Nearly one-half, 291 (48.4%), of participants think they did not know they are susceptible to HPV infection. Around one-fourth, 157 (26.1%), of participants think the HPV vaccine was safe and effective, and 111 (18.5%) study participants reported, that being vaccinated for HPV reduces the risk of having an HPV infection. The majority 367 (61.1%) of girls' said that vaccinating against HPV will not encourage them to start sexual activity. Nearly one-third of 179 (30%) participants think vaccinated against HPV if the vaccination was freely available. The majority of 473 (78.7%) participants reported being afraid of the mild side effects of the HPV vaccine. Nearly one-fourth, 145 (24.1%), of participants think the HPV vaccine was effective in preventing CC and 200 (33.3%) participants think only those who were promiscuous would benefit from the vaccine (Table 3).

### 3.4 | Predictors Associated With Girl's Knowledge

Four variables were identified as significant associations between participants' knowledge of the HPV vaccine using multivariable binary regression analysis (Table 3).

**TABLE 1** | Participants' characteristics in Debre Berhan city, 2023 (N = 601).

Variables		Number (%)
Age	14–15	293 (48.7)
	16–17	308 (51.3)
Student's level of education	Primary school	282 (47)
	Secondary school	319 (53)
Fathers' educational status	Only read and write	19 (3.2)
	Primary education	216 (36)
	Secondary education	177 (29.5)
	Diploma and above	189 (31.3)
Mothers' education status	Only read and write	57 (9.5)
	Primary education	129 (21.5)
	Secondary education	312 (51.9)
	Diploma and above	103 (17.1)
Maternal occupation	Government employee	124 (20.6)
	Merchant	107 (17.8)
	Private employee	212 (35.3)
	Farmer	132 (22)
	House-wife	17 (2.8)
	Others <sup>a</sup>	9 (1.5)
Fathers' occupation	Merchant	137 (22.8)
	Government employee	289 (48.1)
	Private employee	86 (14.3)
	Farmer	41 (6.8)
	Others <sup>a</sup>	48 (8)
Birth area	Urban	497 (82.7)
	Rural	104 (17.3)
Living with both parents	Yes	467 (77.7)
	No	134 (22.3)
Start sexually intercourse	Yes	177 (29.5)
	No	307 (51.1)
	Don't answer	117 (19.4)
Age of onset in years	12–15	59 (33.3)
	16–17	118 (66.7)
Have information about the HPV vaccine?	Yes	133 (22.1)
	No	468 (77.9)
Source of information about the HPV vaccine	Mass-media	68 (51.1)
	Health-worker	32 (24.1)
	Internet	15 (11.3)
	School	18 (13.5)

<sup>a</sup>Day worker, chauffeur, and spiritual guide.

Individuals aged 16–17 were over twice as likely to be aware of the HPV vaccine in comparison to those in the 14–15 age group (AOR: 2.2; 95%CI: 0.51, 0.87;  $p = 0.002$ ). Furthermore, those who had a secondary school level of academic achievement were 2.39 times more inclined to know of the

HPV vaccine than those who had a primary school education level (AOR: 2.39; 95%CI = 5.42, 9.74;  $p = 0.04$ ). Respondents who had not been informed about the HPV vaccine before the current research were approximately 65% less likely to be aware of the HPV vaccine in comparison to those who had

**TABLE 2** | Knowledge of girls about HPV vaccine at Debre Berhan city, 2023 ( $n = 601$ ).

Knowledge items questions	Girls' response		
	Yes	No	I don't know
Do you have information about CC	161 (26.8)	345 (57.4)	95 (15.8)
CC can cause genital tract disease	186 (31)	112 (18.6)	303 (50.4)
The cause of CC is HPV	87 (14.5)	191 (32)	323 (53.5)
We can prevent HPV infections	211 (35.1)	335 (55.7)	55 (9.2)
Sexual contact transmits HPV	105 (17)	299 (50)	197 (33)
The HPV vaccine is used to prevent HPV infection	142 (23.4)	257 (43)	202 (33.6)
Vaccination against HPV is recommended before sexual activity	57 (9.5)	351 (58.4)	193 (32.1)
To prevent CC in the future HPV vaccine recommended	84 (14)	204 (33.9)	313 (52.1)
For female children aged 9-14 years old, the HPV vaccine can be offered	72 (12)	217 (36.1)	312 (51.9)
HPV vaccine is recommended only for women who have multiple sexual partners	112 (18.7)	151 (25.1)	338 (56.2)
For girls below 14 years, 2 rounds of the HPV vaccine requires	67 (11.2)	187 (31.1)	347 (57.7)
Infertility can be caused by HPV vaccine	42 (7)	183 (30.5)	376 (62.5)
know the HPV vaccine given in schools	108 (18)	278 (46.3)	215 (35.7)
Overall Knowledge score about the HPV vaccine			
Poor knowledge (0–7 out of 13 items)		497 (83)	
Good knowledge (8–13 out of 13 items)		104 (17)	

prior knowledge (AOR = 0.65; 95%CI = 0.42,0.92;  $p = 0.003$ ) (Table 4).

### 3.5 | Predictors Associated With Girl's Attitude About HPV Vaccine

The analysis revealed a significant association between participants' level of education and their attitudes towards the HPV vaccine (Table 5).

Those with a secondary school education were approximately 3.4 times more likely to have a positive attitude towards the vaccine compared to those with only a primary school education (AOR = 3.4; 95%CI: 6.27; 9.73;  $p < 0.001$ ). Additionally, participants who had not received any information about the HPV vaccine before the study were approximately 85% less likely to have a positive attitude towards the vaccine compared to those who had prior knowledge (AOR = 0.85; 95% CI = 0.43–0.59;  $p = 0.01$ ) (Table 5).

## 4 | Discussion

In the current study, more than half of 308 (51.3%) participants found in the 16–17 years old. This finding is in line with a study done in Ambo town, Ethiopia 215 (51.9%) [7] but the study conducted in Malaysia reported that the majority of study participants found in the 14–16 years old (63.4%) [29] and the study done in German reported that 554 (29.1%) found in 16–17 years [30]. The difference could be due to disparities between the age categories among the research participants. The study done in Germany included girls between the ages of 9 and 17, while the study done in Malaysia included girls aged 14 and 16 years.

In our study 319 (53%) study participants' educational level was secondary school. This finding is distinct from that of a study carried out in Ambo, Ethiopia. The majority of participants' educational level was primary school 264 (63.8%) [7].

The majority of study participants living with both parents 467 (77.7%). This finding was comparable with the study conducted in Spain, where 658 (79%) participants lived with both parents [31] but lower than a study conducted in Greece (83.8%) [32].

Of those who took part in the present investigation had poor knowledge (83%) about the HPV vaccine. This finding is higher than a study done in Bahir Dar City, Ethiopia (54.7%) [28] and Uganda (56.09%) [33]. However, this finding is lower than a study done in Nigeria (89.6%) [34]. The differences may be due to differences in accessibility of HPV vaccine information, cultural norms, study environments, number of study participants, and income status.

Less than one-fourth 133 (22.1%) of the participants had information about the HPV vaccine. This finding is lower than a study conducted in Greece (40%) [32]. Providing adequate information is thought to be a useful strategy to improve the currently low rates of HPV vaccination [35]. The difference may be differences in the study setting and study participants' level of education. The study done in Greek included only the secondary school level of education. One possible explanation for this could be that high school students were more likely to study and learn about CC and HPV.

In the current study, more than three-fourths, 497 (83%), of the participants had poor knowledge about the HPV vaccine. This finding is lower than a study conducted in Ambo, Ethiopia (88.6%) [7].



**TABLE 3** | Attitudes of girls about HPV vaccine in Debre Berhan City, 2023 (*n* = 601).

Attitude Item questions	Yes	No	I do not know
Do you believe you could get infected with HPV?	43 (7.2)	267 (44.4)	291 (48.4)
Do you think the HPV vaccine is safe and effective	157 (26.1)	65 (11)	379 (62.9)
Do you believe receiving an HPV vaccine lowers the chance of contracting an infection?	111 (18.5)	178 (29.6)	312 (51.9)
Are you of the opinion that the HPV vaccine won't result in complex sexual activities?	135 (22.5)	378 (63)	88 (14.5)
Do you think vaccinating against HPV will not encourage to start sexual activity	367 (61.1)	131 (22)	103 (16.9)
Do you believe that teens who receive the HPV vaccine are more likely to engage in risky sexual behavior?	94 (15.6)	437 (72.7)	70 (11.7)
In the event that HPV vaccination is widely accessible, would you want to get it?	179 (30)	315 (52.4)	107 (17.6)
If you choose to get an HPV vaccination, knowing more about the virus will help you.	367 (61.1)	91 (15.1)	143 (23.8)
Do you fear that the HPV vaccine will have minimal side effects?	473 (78.7)	122 (20.3)	6 (1)
Are you concerned that the HPV vaccine may cause infertility in the future?	273 (45.4)	294 (49)	34 (5.6)
Do you believe that cervical cancer can be prevented by the HPV vaccine?	145 (24.1)	394 (65.6)	62 (10.3)
Would the vaccine only help people who are promiscuous, in your opinion?	200 (33.3)	342 (56.9)	59 (9.8)
Overall Attitude score of participants			
Positive attitude (7-12 out of 12 items)		275 (45.8)	
Negative attitude (0-6 out of 12 items)		326 (54.2)	

**TABLE 4** | Predictors associated with girl's knowledge about HPV vaccine at Debre Berhan city, 2023 (*n* = 601).

Variables	Category	COR (95% CI)	AOR (95% CI)
Age	14-15	1	1
	16-17	3.12 (0.68,3.51)*	2.2 (0.51,0.87)**
Level of education	Primary school	1	1
	Secondary school	3.27 (2.13, 3.96)*	2.39 (5.42, 9.74)**
Place of birth	Rural	1	1
	Urban	0.34 (0.82,0.93)	2 (0.23, 2.87)
Having information about the HPV vaccine	Yes	1	1
	No	0.57 (0.45,0.69)*	0.65 (0.42,0.92)**
Source of information about the HPV vaccine	Mass-media	1	1
	Health-worker	2.40 (3.34,4.54)*	2.54 (4.27,7.73)**
	Internet	0.57 (0.44,2.81)	0.27 (0.34,3.51)
	school	1.33 (0.48,2.77)	2.62 (0.88,5.97)

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

\*\*Significance at *p* < 0.05.

\*Factors eligible for a multivariable binary regression analysis.

More than half of the participants, 345 (57.4%), had no information about CC and only 161 (26.8%) study participants heard about CC. This finding is lower than the study conducted in Malaysia (66.3%) [29] and Greece (75.5%) [32]. The difference may be due to differences in the study participants' level of education and study setting. The study conducted in Malaysia included only secondary school level of education but we included both primary and secondary level of education.

Below one-fourth of 142 (23.4%) participants knew the HPV vaccine used to prevent HPV infection. This finding is lower than a study conducted in Malaysia (50.3%) [29] and Bahir Dar City, Ethiopia (51.6%). The difference may be due to differences in the included study participants. The study participants included in Malaysia and Bahir Dar City, Ethiopia studies involve only secondary school educational level girls.

**TABLE 5** | Predictors of girl's attitude towards HPV vaccine at Debre Berhan City, 2023 ( $n = 601$ ).

Variables	Category	COR (95% CI)	AOR (95% CI)
Age in years	14–15	1	1
	16–17	0.61 (0.17,0.80)*	0.86 (0.99,2.75)
Level of education	Primary school	1	1
	Secondary school	2.40 (0.34,0.24)	3.4 (6.27,9.73)**
Having information about the HPV vaccine	Yes	1	1
	No	0.36 (0.62,0.92)*	0.85 (0.43,0.59)**
The information about the HPV vaccine	Mass-media	1	1
	Health-worker	3.40 (2.34,4.24)	3.24 (0.27,8.73)
	Internet	0.77 (0.64,2.31)	0.47 (0.34,1.51)
	School	1.33 (0.48,0.77)*	2.62 (0.88,5.97)

Note: \*Indicates significant association in the univariate analysis, \*\*indicates statistically significant association in the multivariate analysis.

In our study, 87 (14.5%) participants knew the cause of CC was HPV. This finding is lower than a study done in Malaysia (52.8) [36], Spain (89.9%) [31], and Greek (31.9%) [32].

Overall, nearly half (45.5%) of participants had a positive attitude towards the HPV vaccine. This finding is lower than a study done in Uganda (83.4%) [33]. Likewise, this finding is higher than a study conducted in Italy (20%) [37]. Inequalities in socioeconomic status, educational attainment, and insufficient coverage of targeted educational initiatives (poor information availability in low-income nations) could account for the discrepancy [20, 38].

In our study, when girls had access to sources of information from medical professionals, their knowledge of the HPV vaccine increased by almost 2.54 times that of their counterparts. This finding was in line with a study conducted in the United States, using medical professionals and educational institutions as their main sources of information regarding the HPV vaccine [39]. This is because the majority of schoolgirls believe that health professionals know more about vaccines than people in any other profession, thus they trust the information they provide to them.

In the current study, participants who had a secondary school level of education were 2.39 times more likely to know about the HPV vaccine than participants who had a primary school education level. This finding was consistent with studies conducted in Bahir Dar City, Ethiopia [7] and Nepali [40]. The explanation could be that high school students were more inclined to read and study about CC and HPV vaccines than primary school students.

Participants who were not informed about the HPV vaccine before our study were significantly less likely, by approximately 85%, to hold a positive attitude towards the vaccine compared to those who had received prior knowledge about it. This finding was in line with studies done in Debre Markos town, Ethiopia [41], Nigeria [28], and Uganda [33]. Having effective health information systems is crucial for encouraging individuals with a favorable view of the vaccine to make use of it.

## 4.1 | The Strengths and Limitations of the Study

There are various strengths and limitations to this study. It is not possible to establish a causal relationship between the outcome variable and the demographic and clinical characteristics of research participants due to the cross-sectional nature of the study. Interviews with study participants yielded the majority of the data that was gathered. Recall bias and the omission of important details might happen. It was challenging to draw conclusions that applied to all adolescent girls in comparable age groups because the study was restricted to school settings.

Despite these limitations, this study used a representative sample by using a high sample size and this study also suggested that healthcare personnel should give counseling to adolescent school-age girls about the HPV vaccine's clinical importance to enhance their knowledge and attitude about the HPV vaccine.

## 5 | Conclusions and Recommendations

Adolescent girls had negative attitudes and poor knowledge about the HPV vaccine. Adolescent girl's age and level of education were identified as predictors of girls' knowledge of the HPV vaccine.

Adolescent girls should be educated about CC and HPV infection to improve their knowledge and attitude about the HPV vaccine using health professionals and mass media. Further, large sample sizes in this subject matter are required as well for further investigation.

### Author Contributions

**Siraye Genzeb Ayele:** conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, visualization, writing – review and editing, software, formal analysis, project administration, data curation, supervision, resources. **Abate Wondesen Tsige:** conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, visualization,

writing – review and editing, software, formal analysis, project administration, data curation, supervision; resources.

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## Conflicts of Interest

The authors declare no conflicts of interest.

## Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## Transparency Statement

The lead author Siraye Genzeb Ayele 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.

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