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Knowledge and attitude about human papillomavirus vaccine among female high school students at Jimma town, Ethiopia

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ABSTRACT

Background: The Human Papilloma Virus (HPV) is the primary causative agent of cervical cancer. HPV vaccination against human papillomavirus is more effective against cervical cancer. Therefore, this study aimed to investigate the knowledge and attitudes toward the human papillomavirus vaccines among female high-school students.

Methodology: This cross-sectional study was conducted among female high-school students in Jimma town, Ethiopia. Study participants were selected using a simple random sampling method. Self-administered interviews were conducted using a structured questionnaire. Data were entered using Epi-data version 3.5, exported and analyzed using the statistical package for the social sciences (SPSS) version 21. The Chi-squared (χ^2) test was performed to determine the statistical significance between the outcome variable and independent variables.

Results: A total of 366 students participated in this study with a response rate of 94.8%. Only half (52.7%) and nearly one-third (31.4%) of the respondents had good knowledge and positive attitudes toward HPV vaccination, respectively. The predictors that included parents' educational status ($\chi^2 = 1.479$, $P = .003$), students participating in school mini-media ($\chi^2 = 1.519$, $P = .036$), students who had a smartphone ($\chi^2 = 2.118$, $P = .008$), availability of radio or television (TV) at home ($\chi^2 = 2.163$, $P = .049$), and students who received information from social-media ($\chi^2 = 2.15$, $P = .025$) were significantly associated with knowledge of the HPV vaccine.

Conclusion: Overall knowledge and attitude toward HPV vaccination were low. All concerned bodies should work jointly to enhance the knowledge and attitudes of female students toward Human Papilloma Virus vaccination.

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Knowledge; attitude; human papillomavirus; HPV vaccine

Introduction

Globally, cervical cancer is the fourth most frequently diagnosed cancer and the fourth leading cause of cancer-related deaths in women, with an estimated 604,000 new cases and 342,000 deaths worldwide in 2020¹. According to the 2020 international agency for research on cancer report, 12.4 and 5.2 per 100,000 women died due to cervical cancer in developed and developing countries, respectively.²

The Centers for Disease Control and Prevention (CDC) also revealed that cervical cancer was the leading cause of cancer-related deaths in women in the United States. However, in the past 40 years, the number of cervical cancer cases and deaths from cervical cancer has decreased significantly.³ The Pap smear and HPV vaccination play significant roles in the reduction of cervical cancer cases.

The Ethiopian Ministry of Health has placed high emphasis on the prevention and control of cervical cancer, by breaking the root cause of cervical cancer and the chain of disease transmission.^{4,5} Human papillomavirus (HPV) is a primary cause of cervical cancer. HPV is a sexually transmitted disease that makes transmission easy through coitus from partners and

doubles health burden.⁶ In Ethiopia the HPV vaccination was officially launched on 06-December-2018 held at Tesfa Kokeb Primary School in Lideta Sub-city of Addis Ababa, and the Ministry of Health planned to vaccinate over one million girls aged 14 years with age.⁴ Ethiopia immunizes over 2 million 14 year-old girls against HPV across the country in two schedules /timelines. The first event required the first dose of the vaccine, while the second required the second dose of the vaccine (HPV2),⁷ which they missed because of school closures in the wake of the COVID-19 pandemic. Vaccination was conducted in schools, communities and health facilities from January 25 to 29, 2021.⁷

Providing HPV vaccination for eligible persons has remarkable value for prevention, and decreasing the impact of cervical cancer. HPV vaccines targeted against high-risk HPV (types 16&18) have a higher potential to eliminate approximately 0% of invasive cervical cancer in women.⁸

Knowledge and attitude have been shown to be important determinants of future vaccine acceptance.⁹ In addition, parents' lack of knowledge or misconceptions about HPV vaccines is a major factor in the acceptance of the vaccine. Numerous studies have assessed the knowledge and attitudes toward HPV

vaccines worldwide. Studies conducted in Africa including; Kenya, Nigeria, South Africa and Egypt on knowledge of HPV vaccination revealed that 48%, 40%, 2.2% and 15.7% of study participants had good knowledge respectively.^{10,11,12,11} Furthermore, studies conducted in Eastern US, China, Iran, Spain, India and Malaysia on knowledge of HPV vaccine among study participants revealed that 55%, 13.8%, 54.8%, 54.3%, 44% and 50.8% of respondents had good knowledge respectively.^{12,15,16,17,18,13} Various factors may affect knowledge and attitudes toward HPV vaccines. The predictors included the highest level of education, students aged >21 years, in the last years of their degree, with high economic status and previous sexual experience, and who knew and received HPV vaccination information from their general practitioner or gynecologist, which were strongly associated with knowledge about HPV vaccine.^{14,15}

The global cancer burden is expected to be 28.4 million cases in 2040, a 47% rise from 2020, with a larger increase in developing (64% to 95%) versus developed (32% to 56%) countries.² Worldwide cervical cancer remains one of the gravest threats to women's lives, and globally, one woman dies of cervical cancer every 2 min. In 2018, the substantial global burden of cervical cancer and the increasing inequity, the WHO Director-General made a call for global action toward the elimination of cervical cancer (≤ 4 per 100,000 women worldwide) through the triple-intervention strategy: – vaccinating 90% of all girls by age 15 years, screening 70% of women twice in the age range of 35–45 years, and treating at least 90% of all precancerous lesions detected during screening.¹⁶ The vaccination of all girls could be achieved by advancing the knowledge and attitude of the community, parents, and female students toward HPV vaccination.

Previous studies have focused more on cervical cancer screening; however, there have been limited investigations on HPV vaccine knowledge among secondary school students in Ethiopia. However, creating awareness, and shape to have a favorable attitude toward the HPV vaccine is one of the key indicators for the prevention and control of cervical cancer. Therefore, this study aimed to assess knowledge and attitude toward the HPV among female high-school students in Jimma town, Ethiopia.

Materials and methods

Study area

The study was conducted in Jimma town, Oromia region, southwest Ethiopia. Jimma town is located 352 km from Addis Ababa to the Southwest with a total population of 120,950, of whom 60,136 were women. The study was conducted from May 13-September 10, 2021. According to the 2019/20 report of the Ethiopian ministry of education, there are 3688 secondary education facilities in Ethiopia of which 39% are located in Oromia. Jimma town has eight private high schools and seven governmental high schools and there are 7662 and 1056 female students in private and governmental high schools, respectively.

Study design

A school-based cross-sectional study was conducted from May 13-September 10, 2021, in selected high schools in Jimma town, Ethiopia.

Source population

All-female students were enrolled in high schools for the 2021 academic year in Jimma town.

Study population

All selected female high-school students enrolled in the selected high school for the 2021 academic year in Jimma town.

Eligibility criteria

Female students attending the selected high schools who were willing and available in class during the data collection period were included in this study. Students who abstained from class during the data collection period were excluded.

Sample size and sampling technique

Considering the absence of previous data on specific study populations and topics of HPV vaccination, a maximum sample size 50% of prevalence was used in the calculation. The proportion of sample size was calculated using a single proportion population formula. The following assumptions were made: by considering the proportion of 50% ($p = .5$), design effect of 5% and 95% confidence interval. The estimated sample size was 384. Because, the population was less than 10,000, by considering this after using the correction and by adding a 5% non-response rate the final sample size was 386. First, five schools were randomly selected from 15 high schools in Jimma town. Proportional allocation of the sample to the size of the school, in terms of the number of students, was performed to obtain study participants from each school.

Study variables

Dependent variable

Knowledge and Attitude toward HPV vaccine.

Independent variables

Socio-demographic variables. Age, Religion, parents' marital status, parents' education status, parents' occupation, and parents' income.

Source of information. Participation in school mini-media, Peer, availability of (Radio, TV, smart phones, magazines, leaflet), and utilization of social Media (Facebook, Telegram, Twitter, etc).

Operational definition and definition of terms

Human papillomavirus. A virus that infects the skin or mucous membranes such as the genitals or inside the mouth of humans which can cause cervical cancer or warts.

HPV vaccine. Vaccine prevents infection by certain types of human papillomavirus.

Good knowledge. The respondents who answered > 50% of the questions correctly were categorized as having good knowledge of HPV.¹⁷

Poor knowledge. The respondents who answered < 50% of questions correctly were categorized as having low knowledge about HPV.

Attitude. Respondents' attitudes toward HPV infection and vaccines were categorized as follows: negative if they obtained less than %50, neutral for 50%–75%, and positive for more than %75 of the total attitude score.¹⁸

Data collection instrument and procedure

The study employed a pretest and self-administered questionnaire after adapting the questionnaires from different literature and making the necessary modification accordingly.^{10,11,19} The questionnaire was administered to the students and the data from the questionnaire were processed anonymously by assigning random codes, which were divided into four sections that included respondents' socio-demographic characteristics, questions to assess the source of information, part three deals with the attitude of the HPV vaccine, and part four deals with respondents' knowledge of cervical cancer.

Quality control

A pre-tested and structured questionnaire was used in this study. A pretest study was conducted with a small sample (5%) before the actual data collection period to ascertain whether participants understood the questions in similar ways to ensure consistency. Two BSc midwives and one MSc personnel were recruited as the data collectors and supervisors, respectively. The data collectors were trained in the data collection process for 1 day. The principal investigator checked the data for completeness and consistency at the end of each day for better readability.

Data analysis

Data coding and entry were performed using Epidata version 3.5 and Data analysis was performed using SPSS version 22. The Chi-squared (χ^2) test was performed to determine the statistical significance between the predictors and outcome variable. Predictors with a p-value <0.05 were considered statistically significant with the outcome variable. Descriptive analysis frequencies, percentages, means and standard deviations were computed to explore the socio-demographic factors of the study participants. The result findings were presented using text, tables, figures, and graphs.

Ethical consideration

This study was approved by the Institutional Review Board of Jimma University (Ref: No IRB119/2020). Permission letters were written for each of the four selected high-school principals. The participants were informed of the study's objectives and their right to terminate their participation study at any time, that their information was kept confidential and that verbal informed consent was obtained from all participants.

Results

Socio-demographic characteristics

A total of 366 students participated in this study with a response rate of 94.8%. Of the respondents 267 (72.9%) were between ages 16–20, 131 (35.8%) were Muslims followed by orthodox Christian 127 (34%). Most of 100 (27.3%) students' parents had a diploma and above educational status, 121 (33%) were governmental employees and 174 (47.5%) had >3501 ETB monthly income (Table 1).

Table 1. Socio-demographic characteristics of high school students, Jimma town, 2021.

| R. N | Variables | Category | Frequency | Percentage (%) |
|------|---------------------------------------|-----------------------------|-----------|----------------|
| 1. | Age | 11-15 | 91 | 24.8 |
| | | 16-20 | 267 | 72.9 |
| | | >20 | 8 | 2.1 |
| 2. | Religion | Muslim | 131 | 35.8 |
| | | Orthodox | 127 | 34.8 |
| | | Protestant | 70 | 19.1 |
| | | Catholic | 29 | 7.9 |
| | | Other | 9 | 2.5 |
| 3. | Parents educational status | Illiterate | 80 | 21.9 |
| | | Complete primary school | 70 | 19.1 |
| | | Complete secondary school | 66 | 18 |
| | | Complete preparatory school | 50 | 13.7 |
| | | Diploma and above | 100 | 27.3 |
| 4. | Parents occupation | Governmental employee | 121 | 33.1 |
| | | Non-governmental employee | 47 | 12.8 |
| | | Merchant | 81 | 22.1 |
| | | Daily labor | 38 | 10.1 |
| | | Unemployed | 28 | 7.7 |
| | | Other | 51 | 13.9 |
| | | Other | 51 | 13.9 |
| 5. | Parents monthly income | <1000 | 121 | 33.1 |
| | | 1001-1500 | 46 | 12.6 |
| | | 1501-2500 | 16 | 4.4 |
| | | 2501-3500 | 9 | 2.5 |
| | | >3501 | 174 | 47.5 |
| 6. | Have older sister | Yes | 135 | 68 |
| | | No | 231 | 31.4 |
| 7. | Participate in school mini-media club | Yes | | |
| | | No | | |
| 8. | Have mobile phone | Yes | 302 | 82.5 |
| | | No | 64 | 17.5 |

Table 2. Source of information regards to HPV vaccination among Jimma town high school female students, Jimma, Ethiopia, 2021.

| Variables | Category | Frequency | Percent (%) |
|--------------------------------------|------------------|-----------|-------------|
| Have TV or radio at home | Yes | 335 | 91.5 |
| | No | 31 | 8.5 |
| Aware of HPV vaccine | Yes | 202 | 55.2 |
| | No | 164 | 44.8 |
| Source of information of HPV vaccine | Media | 63 | 17.2 |
| | Internet | 31 | 8.5 |
| | Parents | 28 | 7.7 |
| | Peer | 16 | 4.4 |
| | Book or Magazine | 22 | 6.0 |
| | Teacher | 46 | 12.6 |

Source of information

Most of 335 (91.5%) respondents had TV or Radio at their home and the majority of the respondents 202 (55.2%) were aware of HPV vaccine. Furthermore, 302 (82.5%) of the respondents had mobile phones and 63 (17.2%) made use of social media as the best source of information (Table 2).

Attitude toward HPV vaccine

Most of the respondents 277 (75.7%) were of the opinion that if they feel at risk of getting HPV, they will take the vaccine, Other findings showed that 246 (67.2%) of the respondents were of the opinion that being infected with HPV is very deadly and can lead to death, 265 (72.4%) of the respondents thought that by taking the vaccine, they would be safe and healthy, and 127 (34.7%) said that their parents must be the one to decide for them (Table 3).

Overall attitude about the HPV vaccine

In Figure 1 shows that approximately 31.4%, 65.6% and 3% of the participants had positive, neutral and negative attitudes toward HPV vaccination, respectively.

Knowledge toward HPV vaccine

The majority of respondents 257 (70.2%) had heard of the HPV vaccine and 273 (74.6%) knew that the HPV vaccine could prevent the development of genital warts and cervical cancer. Most of the respondents 238 (65%) knew that HPV infection is sexually transmitted. A large proportion of the participants 259 (70.9%) knew that both women and men were infected with HPV infection. More than one-fourth 107 (29.2%) of respondents thought that only women could be infected with the HPV infection (Table 4).

Overall knowledge status

A total of 193 (52.7%) respondents had good knowledge of HPV vaccination; while the remaining 173 (47.3%) participants had poor knowledge (Figure 2).

Factors associated with knowledge about HPV vaccine

The chi-squared test results showed that parents' educational status ($\chi^2 = 1.479$, $P = .003$), participation in school mini-media ($\chi^2 = 1.519$, $P = .036$), students who had a smartphone

($\chi^2 = 2.118$, $P = .008$), availability of radio or TV at home ($\chi^2 = 2.163$, $P = .049$), awareness of HPV vaccine ($\chi^2 = 2.292$, $P = .001$) and source of information ($\chi^2 = 2.15$, $P = .025$) predictors were significantly associated with knowledge of the HPV vaccine (Table 5).

Respondents who had older sisters had better knowledge about the HPV vaccine than those who did not have older sisters. Participants who had older sisters were 1.6 times more likely to have a chance to hear about the HPV vaccine than their counterparts ($\chi^2 = 1.674$, $P = .032$). Furthermore, respondents who had a hand smartphone were twice as likely to get a chance to hear the availability of HPV vaccine relative to participants who did not have a hand smartphone ($\chi^2 = 2.299$, $P = .003$) (Table 6).

Discussion

Cervical cancer is the predominant cancer among a variety of cancer and a leading cause of morbidity and mortality among women in developing countries. HPV is the common sexually transmitted disease and a prime cause of cervical cancer it accounts for around 80–99%.²⁰ To prevent and control cervical cancer; awareness of HPV infection, mode of transmission, and vaccination is important. Enhancing the target population (13–26 age group) knowledge, attitude, and perception toward HPV vaccination is significant for a steady increment in the intention to take the vaccine by filling the gap of misconception.

The current study showed that about 31.4%, 65.6% and 3% of the participants had positive, neutral and negative attitudes toward HPV vaccination, respectively. This finding was slightly lower than that in studies conducted in Iran and Nigeria that revealed that about (43%) and (61.8%) of respondents had a positive attitude toward HPV vaccination, respectively.^{18,21} In part of this, a study conducted in South Africa revealed that a large proportion of respondents (92.1%) displayed negative attitudes to the use of vaccines.¹⁴ This may be due to differences in socio-demographic characteristics, health literacy, health care services, and health education programs.

In the present study, 193 (52.7%) respondents had good knowledge of HPV vaccination. This is in line with studies conducted in Malaysia and Italy 51.1% and 56.3% of participants had good knowledge of HPV vaccine, respectively.^{22,23} However, this finding is relatively higher than that in a study conducted in Nigeria, South Africa and India where respondents who had good knowledge about HPV vaccine accounted 18.3%, 44% and 2.1%, respectively.^{14,24,25}

The current study showed that 257 (70.2%) female students had heard HPV vaccination. This is relatively higher than studies conducted in Nigeria, South Africa and Malaysia revealed that 29.4%, 8.8% and 50.8% of respondents had heard about the HPV vaccine, respectively.^{13,14,19} This discrepancy might be due to the sampling size, sampling technique, study area, period, and health literacy. However, this is lower than a study conducted in India, which revealed that more than 80% of the participants were aware that a vaccine is available against HPV.²⁶ This may be due to previous studies involving medical and nursing students who are close to medical information while teaching and learning processes.

Table 3. Attitude toward HPV vaccination among Jimma town high school female students, Jimma, Ethiopia, 2021.

| Attitude items | Agree | Disagree | Undecided |
|---|-------------|------------|-----------|
| Feel at getting the risk of getting HPV, Will take the vaccine | 277(75.7%) | 75(20.5%) | 14(3.8%) |
| Infected with HPV vaccine is deadly | 246(67.2%) | 95(26%) | 25(6.8%) |
| The vaccine will keep safe and healthy | 265(72.4%) | 76(20.8%) | 25(6.8%) |
| Parents must decide whether to take vaccine or not | 127(34.7%) | 196(53.6%) | 43(11.7%) |
| The cost of the vaccine discourages | 110(30.1%) | 204(55.7%) | 52(14.2%) |
| The safety of the vaccine encourages me | 203(55.5%) | 120(32.8%) | 43(11.7%) |
| Use the vaccine if it is available at the clinic free to students | 248(67.8%) | 91(24.9%) | 27(7.4%) |
| Feeling embarrassed to get a vaccination | 107 (29.2%) | 227(62.1%) | 32(8.7%) |
| Don't know much about the vaccine so not take the vaccine | 120(32.8%) | 154(42.1%) | 92(25.1%) |

Table 4. Knowledge toward HPV vaccination among high school female students at Jimma town, Ethiopia, 2021.

| Knowledge's items | Category | |
|---|------------|------------|
| | Yes n (%) | No n(%) |
| Do you heard about the HPV vaccine | 257(70.2%) | 109(29.8%) |
| HPV vaccination is currently offered freely to secondary school girl | 241(65.8%) | 125(34.2%) |
| The HPV vaccine is delivered in a series of 3 shots injection over 6-month schedule | 238(65%) | 128(35%) |
| The HPV vaccine is most effective on someone who is not sexually active | 164(44.8%) | 202(55.2%) |
| HPV Vaccination is allowed in all religion | 287(78.4%) | 79(21.6%) |
| The HPV vaccine can prevent the development of genital warts & cervical cancer | 273(74.6%) | 93(25.4%) |
| The HPV vaccine is currently accessible to men | 107(29.2%) | 259(70.8%) |
| HPV Vaccine is available for which age group | | |
| 9–13 years | 133 | 36.3% |
| 18–21 years | 117 | 32% |
| All ages | 54 | 14.8% |
| I don't know | 62 | 16.9% |

Table 5. Predictors associated with knowledge of HPV vaccination among high school female students at Jimma town, Ethiopia 2021.

| Predictors | Knowledge status | | Chi-square (χ^2) | P-value |
|--|------------------|------------|-------------------------|---------|
| | Good | Poor | | |
| Age(16–20) | 145(39.6%) | 122(33.3%) | .613 | .502 |
| Parents' education(diploma and above) | 56(15.3%) | 44(12.02%) | 1.479 | .003* |
| Parents' occupation as Governmental employee | 66(18.0%) | 55 (15.0%) | 1.350 | .673 |
| Parents' income >3500ETB | 94(25.7%) | 80(21.9%) | 1.276 | .598 |
| Who has an older sister | 141(38.5%) | 110(30.1%) | 1.553 | .052 |
| Participate in School mini-media | 80(21.9%) | 55(15.0%) | 1.519 | .036* |
| Have you smartphone | 169(46.2%) | 133(36.3%) | 2.118 | .008* |
| Radio or TV availability at home | 182(49.7%) | 153(41.8%) | 2.163 | .049* |
| Awareness toward HPV vaccine | 125(34.2%) | 77(21.0%) | 2.292 | .001* |
| Source of information | | | | |
| Media(TV, Radio) | 43(20.9%) | 20(9.7%) | 2.150 | .025* |
| Internet | 16 (7.8%) | 15(7.3%) | 1.067 | |

Key: *imply that statistically significant at a P value of less than 0.05.

Table 6. Predictors associated with heard about HPV vaccine among high school female students at Jimma town, Ethiopia 2021.

| Predictors | Heard about the HPV vaccine | | Chi-square (χ^2) | p-Value |
|--|-----------------------------|------------|-------------------------|---------|
| | Yes | No | | |
| Age(16–20) | 193(52.7%) | 74(20.2%) | 1.106 | .364 |
| Parents' education(diploma and above) | 72(19.7%) | 28(7.7%) | 1.385 | .314 |
| The parent who was a governmental employee | 89(24.3%) | 32(8.7%) | 1.576 | .619 |
| Parents' income >3500ETB | 122(33.3%) | 52(14.2%) | .968 | .791 |
| Do you have older sister | 185(50.5%) | 66(18.0%) | 1.674 | .032* |
| Participate in School mini-media | 101(27.6%) | 34 (9.3%) | .700 | .143 |
| Have you smartphone | 222 (60.7%) | 80 (21.9%) | 2.299 | .003* |
| Radio or TV availability at home | 238 (65.0%) | 97 (26.5%) | 1.550 | .259 |
| Source of information | | | | |
| Media(TV, Radio) | 49 (23.8%) | 14 (6.8%) | 1.029 | .940 |
| Internet | 26 (12.6%) | 5 (2.4%) | – | – |

Key: *imply that statistically significant at a P value of less than 0.05.

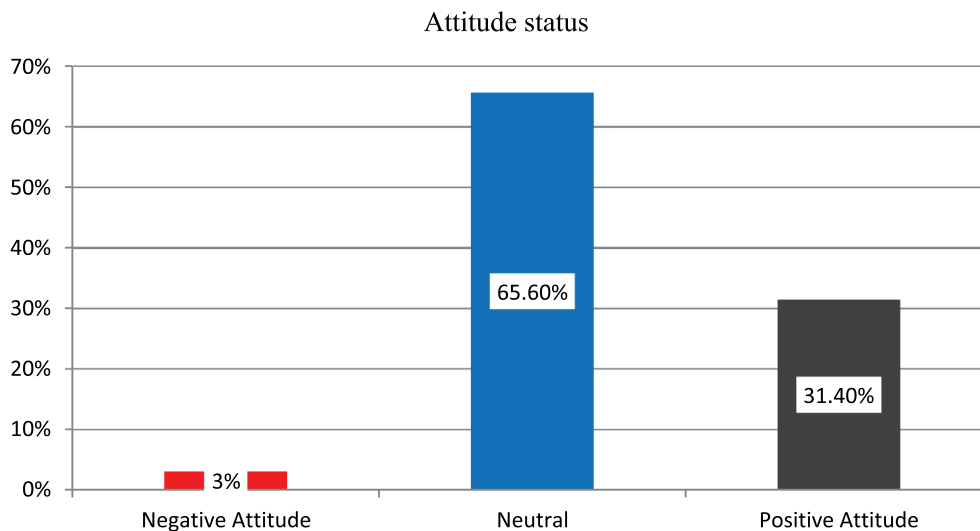


Figure 1. Respondents' attitude toward HPV vaccine at Jimma town, Ethiopia 2020.

Knowledge status of respondents

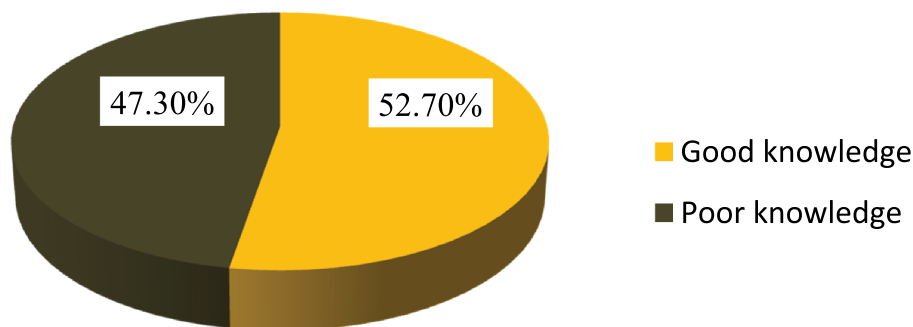


Figure 2. Knowledge of respondents toward HPV vaccine at Jimma town, Ethiopia 2020.

The association between variables shows that female students who participated or were involved in school mini-media club were 1.5 times more likely to have good knowledge than those who did not participate in school mini-media clubs ($\chi^2 = 1.519$, $P = .036$). This is possible because school mini-media clubs are a means of information dissemination, health education, and awareness creation for students and indirectly for the whole community. The direct participants are more beneficiaries of media access.

Moreover, respondents who had smartphones were twice as likely to have better knowledge as their counterparts ($\chi^2 = 2.118$, $P = .008$). This is due to respondents who have hand smartphones; they have a chance to easily access health-related information such as updated posts, messages, or tags from the Ministry of Health (MoH) and research findings via

the internet and Facebook. Similarly ways a study conducted in Taiwan²⁷ confirm that the effectiveness of a Facebook-assisted teaching method on knowledge and attitudes toward HPV Vaccination.

The predictors that included students with parents' educational status ($\chi^2 = 1.479$, $P = .003$), availability of Radio or TV at home ($\chi^2 = 2.163$, $P = .049$), awareness of HPV vaccine ($\chi^2 = 2.292$, $P = .001$) and students who received information from social-media ($\chi^2 = 2.15$, $P = .025$) were significantly associated with knowledge of the HPV vaccine.

In the current study finding students with diploma educated parents was significantly associated with HPV vaccine knowledge compared to illiteracy ($\chi^2 = 1.479$, $P = .003$). This is supported by a study conducted in Malaysian²⁸ Students with tertiary educated fathers or mothers demonstrated higher

cervical cancer prevention knowledge compared to those with less educated ones. The possible reason for this is that those educating parents are well oriented/alert and near to information provision by the government, non-governmental organizations and media.

In addition, respondents who had older sisters had a positive association with the hearing status of the HPV vaccine. The respondents who had older sisters had a better chance of being heard about the HPV vaccine from their previous experience compared to those participants who did not have older sisters. Participants who had older sister were 1.6 times more likely to hear about the HPV vaccine than their counterparts ($\chi^2 = 1.674$, $P = .032$). Furthermore, respondents who had smartphones were 2 times more likely to get a chance to hear the HPV vaccine relative to participants who did not have a smartphone ($\chi^2 = 2.299$, $P = .003$).

Limitation of the study

The main limitation of this study is that it does not involve male students as study participants. The second limitation is that some students were older than the expected target population age for human papilloma virus vaccination, which might be creating bias.

Conclusion

The overall knowledge and attitude toward HPV vaccination were relatively low compared to previous researches. Parents' educational status, participating in school mini-media, students who have a smartphone, availability of radio or TV at home, and preferred media as a source of information predictors were significantly associated with knowledge toward HPV vaccine. All concerned bodies should work jointly to enhance knowledge and attitudes of female students toward HPV vaccination.

Abbreviations

| | |
|-------|---|
| CC | Cervical cancer |
| CDC | Centers for diseases control and prevention |
| HPV | human papillomavirus |
| MoH | Minister of Health |
| MoSHE | Minister of Science and Higher Education |

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Disclosure statement

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Ethical approval

Ethical clearance was obtained from the institutional review board of Jimma University (Ref: No IRB/119/2020). Permission was obtained from the Jimma town high schools to conduct the study. Moreover, verbal informed consent was obtained from each respondent after providing sufficient information about a study and the right to refuse participation. To ensure the confidentiality, name of respondents was not written on the questionnaires.

Data availability statement

The data is available at correspondence author upon reasonable request.

Author contributions

TB: Prepared the manuscript, reviewing, editing the manuscript, statistically analyzed and interpreted. AY:¹ writing the original draft, designed the study, preparing the manuscript, reviewing, editing the manuscript. AY:² designed the study, preparing the manuscript, reviewing, editing the manuscript, and critically reviewed the article. BF: designed the study, preparing the manuscript, reviewing, editing the manuscript. All authors' were contributions to conception and design, acquisition of data, analysis, and interpretation of data, drafting the article, and revising critically. All authors have read and approved the final manuscript draft to be published. Furthermore, authors were agreed to take responsibility and be accountable for the contents of the article.

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English Version Survey or Questionnaires

PART ONE: Socio-demographic characteristic questions

| R. N | Variables | Category |
|------|---|--|
| 1. | Age | |
| 2. | Religion | <ul style="list-style-type: none"> ● Muslim ● Orthodox Christian ● Protestant Christian ● Catholic ● Other |
| 3. | Parent's Education status | <ul style="list-style-type: none"> ● Illiterate ● Complete primary school ● Complete secondary ● Complete preparatory school ● Diploma and above |
| 4. | Parent's occupation | <ul style="list-style-type: none"> ● Governmental employee ● Non-governmental employee ● Merchant ● Daily labor ● Unemployed ● Other |
| 5. | Parent's income | |
| 6. | Do you have older sister? | <ul style="list-style-type: none"> ● Yes ● No |
| 7. | Are you participating in your school mini-media club? | <ul style="list-style-type: none"> ● Yes ● No |
| 8. | Ownership of the mobile phone | <ul style="list-style-type: none"> ● Yes ● No |

PART TWO: Source of information

| n. o | Items | Category |
|------|--------------------------------------|--|
| 1. | Do you have TV or radio in your home | <ul style="list-style-type: none"> ● Yes ● No |
| 2. | Do you aware on HPV vaccine? | <ul style="list-style-type: none"> ● Yes ● No ● If for Q2 responses no skip Q number 3. |
| 3. | Source of information on HPV vaccine | <ul style="list-style-type: none"> ● Media ● Internet ● Parents ● Peer ● Book or magazine ● Teachers |

PART THREE: Attitude regards HPV Vaccine

| R. N | Items | Option | | |
|------|---|--------|----------|-----------|
| | | Agree | Disagree | Undecided |
| 1. | Because I feel at risk of getting HPV, I will take the vaccine | 0 | 0 | 0 |
| 2. | I feel being infected with HPV is very deadly and can lead to death | 0 | 0 | 0 |
| 3. | I think taking the vaccine will keep me safe and healthy | 0 | 0 | 0 |
| 4. | My parents must be the ones to decide whether I take the HPV vaccine or not | 0 | 0 | 0 |
| 5. | The cost of the vaccine discourages me | 0 | 0 | 0 |
| 6. | The safety of the vaccine encourages me | 0 | 0 | 0 |
| 7. | I will use the HPV vaccine if its available in the clinics to students free | 0 | 0 | 0 |
| 8. | I feel embarrassed to get an HPV vaccination | 0 | 0 | 0 |
| 9. | I don't know much about the vaccine so will not take it | 0 | 0 | 0 |

PART FOUR: Knowledge about HPV Vaccination

| R.N | Items | Option |
|-----|---|---|
| 1. | Do you heard about the HPV vaccine | <ul style="list-style-type: none"> ● Yes ● No |
| 2. | HPV vaccination is currently offered freely to secondary school girl | <ul style="list-style-type: none"> ● Yes ● No |
| 3. | The HPV vaccine is delivered in a series of 3 shots injection over 6-month schedule | <ul style="list-style-type: none"> ● Yes ● No |
| 4. | The HPV vaccine is most effective on someone who is not sexually active | <ul style="list-style-type: none"> ● Yes ● No |
| 5. | HPV Vaccination is allowed in all religion | <ul style="list-style-type: none"> ● Yes ● No |
| 6. | The HPV vaccine can prevent the development of genital warts & cervical cancer | <ul style="list-style-type: none"> ● Yes ● No |
| 7. | The HPV vaccine is currently accessible to men | <ul style="list-style-type: none"> ● Yes ● No |
| 8. | HPV Vaccine is available for which age group | <ul style="list-style-type: none"> ● 9-13 years ● 18-21 years ● All ages ● I don't know |