

# Knowledge and Attitude Towards Human Papillomavirus Vaccine and Associated Factors Among Mothers Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia

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**Purpose:** This study aimed to assess knowledge and attitude towards the human papillomavirus vaccine and associated factors among mothers who have eligible daughters.

**Methods:** A community-based cross-sectional study with a total sample of 601 study participants was conducted in Debre Markos town from February to March 2021. The study participants were selected using a multistage sampling technique from mothers who have eligible daughters. The data was collected using an interview administration questionnaire. The data were entered into EPI data version 3.1 then, exported to SPSS version 25 for analysis. Variables with a p-value of < 0.25 in bivariate were a candidate for multivariate and those variables with a p-value of <0.05 in multivariate binary logistic regression were considered as a statistically significant factor for knowledge and attitude of the HPV vaccine.

**Results:** A total of 601 study participants with a response rate of 100% were included in the study. Among participants in this study, 47.6% have good knowledge and 77.4% have a positive attitude towards the HPV vaccine. Knowledge of mothers about HPV vaccine was affected by having degree and above (adjusted odds ratio (AOR) =7.687; 95% CI=1.837–32.168; p=0.005), did not hear about HPV vaccine (AOR=0.172; 95% CI=0.098–0.302; P=0.000), and positive attitude towards HPV vaccine (AOR=2.959; 95% CI=1.580–5.539; P=0.001). Attitude of mothers towards HPV vaccine was affected by did not hear about HPV vaccine (AOR=0.285; 95% CI=0.163–0.499; P=0.000), and good knowledge about HPV vaccine (AOR=2.705; 95% CI=1.454–5.035; 0.002).

**Conclusion:** Knowledge of mothers who have eligible daughters about HPV vaccine was low. Maternal educational level, hearing about the HPV vaccine, and attitude towards HPV vaccine were significantly associated predictors with knowledge towards HPV vaccine. However, the attitude was high and factors associated with attitudes towards the HPV vaccine were knowledge about the HPV vaccine and hearing about the HPV vaccine. An integrated work should be considered by Debre Markos town health office with other non-governmental organizations working on health and health-related issues to improve knowledge about the importance of HPV vaccine for mothers who have eligible daughters.

**Keywords:** knowledge, attitude, human papillomavirus vaccine, mothers, Ethiopia

## Introduction

The human papillomaviruses (HPVs) are a big group of highly ubiquitous, small, non-enveloped double-stranded circular deoxyribonucleic acid viruses. Both women and men are rapidly exposed to it after the onset of sexual intercourse.<sup>1,2</sup> Types 16 and 18 of HPVs are the most prevalent cause of cervical cancer (CC) and the non-oncogenic types of HPV 6 and 11 are identified as the major causes for 90% of genital warts.<sup>3</sup> Above 560,000 new cases of CC and about 275,000 deaths are recorded each year, with more than 80% occurring in developing countries.<sup>4–6</sup>

Globally, in 2018, CC was the fourth most common cancer among women with 570,000 new cases and 311,000 deaths (7.5% of all female cancer deaths). It is also one of the leading causes of cancer deaths among women in low and middle-income countries (LMICs), where 83% of new cases and 85% of related deaths occur.<sup>7</sup>

In sub-Saharan Africa (SSA), 34.8 new cases of CC are detected and 22.5 die per 100,000 women annually. According to the Global, Cancer Incidence, Mortality, and Prevalence (GLOBOCAN) data of 2018 the incidence of CC is 563,847 new cases worldwide, of which 52,633 occur in Eastern Africa.<sup>8</sup>

In Ethiopia, CC orders the second most common type of cancer among women. Every year, 7095 women are identified with CC, and 4732 die from the disease.<sup>9</sup> The human papillomavirus vaccine has the great potential to prevent HPV-related infections for millions of women and men worldwide.<sup>10</sup>

In Ethiopia, the bivalent HPV vaccine was launched on 3rd December 2018 for girls who are 14 years of age.<sup>11</sup> The vaccine is currently being delivered primarily through a School-based approach to reach all 14 years girls.<sup>5</sup> However, Social influence, lack of knowledge about cervical cancer and screening, lack of health education on HPV vaccine were barriers to successful HPV vaccination campaign in Ethiopia.<sup>12</sup>

At present-day even if we have a comparatively clear picture of HPV infection's natural history, oncogenic properties, screening, and prevention algorithms, HPV infection rates continue to persist, particularly in developing countries, where CC occurrence and prevalence are still high. This is due to different reasons, which include low socioeconomic status, lack of population awareness, and inadequately implemented screening and vaccination programs.<sup>13</sup>

Parents have a significant role in the decision-making process regarding the HPV vaccination for their children. Mainly, mothers are the primary decision-makers for their daughters. Human papillomavirus vaccination was initially promoted as a vaccine protecting against a female disease, CC.<sup>14</sup> Despite the free HPV immunization, acceptance of the vaccination program is not guaranteed as some of the parents are still against it due to various reasons. It has been shown that knowledge of the consequences of HPV infection is lacking and many have misconceptions about vaccination.<sup>3</sup>

Lack of parental awareness can result in vaccine refusal and as a result, adolescent girls have expressed their reluctance to vaccinate without parental consent. Parents of adolescent girls need to be aware of HPV, how it is transmitted, and the efficacy of the HPV vaccine in preventing CC.<sup>15</sup> Though knowledge and attitude about HPV vaccination is an essential factor for the success of the vaccination program to prevent CC; most of the mothers did not want HPV vaccination for their daughters as they did not have sufficient knowledge and negative attitude about the HPV vaccine.<sup>16</sup>

A study conducted in Gonder town revealed that the acceptance of HPV vaccination was significantly associated with the level of knowledge about CC, HPV vaccine, and the attitude towards HPV vaccination.<sup>5</sup> Adequate understanding of the level of knowledge and attitude of mothers who have eligible daughters for the HPV vaccine and associated factors could be considered as a prerequisite for the effective vaccination program and the implementation of a sound and accepted primary prevention program of CC. If the attitude to the HPV vaccine is negative they do not allow taking HPV vaccine for their daughters.

Therefore, this study aimed to find out the level of knowledge and attitude towards the human papillomavirus vaccine and associated factors among mothers who have eligible daughters in Debre Markos town, Northwest Ethiopia, 2021.

## Materials and Methods

### Study Design, Area and Period

A community-based cross-sectional study was conducted in Debre Markos town from February to March 2021. Debre Markos is the administrative town of East Gojjam Zone and it is found in the northwest part of the country surrounded by Gozamen woreda in the North, South, and East, and Amended woreda in the West. Debre Markos is located on the main road of Addis Ababa to Bahir-Dar. It is 300 km away from Addis Ababa which is the capital city of Ethiopia and 265 km from Bahir Dar the capital city of Amhara regional state. The town has a comprehensive hospital, 3 governmental health centers, and 7 health posts. Based on the 2007 national census conveyed by the central statistical agency of Ethiopia this town has a total population of 62,497 of whom 29,921 are men and 32,576 women. There are 11 kebeles in Debre Markos.<sup>17</sup>

## Population

The source population was all mothers who had eligible daughters living in Debre Markos town whereas the study population was all mothers who had eligible daughters in the selected kebeles.

## Sample Size Determination

The sample size was calculated by using single population proportion formula, assuming 59.9% had positive attitude towards HPV vaccination from a study conducted in Gonder town.<sup>5</sup> With 95% confidence interval (CI), 5% marginal error (d) and 1.5 design effect. This gives the sample size of 554. Adding 10% non-response the final sample size was 601.

$$n = ((z_{\alpha/2})^2 p (1-p)) \text{ design effect} / d^2$$

$$n = ((1.96)^2 (0.599) (0.401)) (1.5) / (0.05)^2 = 554$$

$$n = 601$$

## Sampling Procedures

A multi-stage sampling technique was applied to select the study participants from Debre Markos town total kebeles. In the study area, there are eleven kebeles. Among 11 kebeles, 5 kebeles were selected by using a simple random sampling method (lottery method), and then proportional allocation was done to each selected kebeles. Assuming the study was involving 45% of total kebeles in the town.

Finally, the household was selected with mothers who have eligible daughters by a consecutive sampling method. The first mother was selected randomly. The total population in the selected kebeles is 981 and the total sample size taken from the selected kebeles is 601. The list of mothers who have eligible daughters was taken indirectly by their daughter's list of registration books for HPV vaccine from Debre Markos health protection center administrator. Then home to home visit was used to get mothers who fulfilled the inclusion criteria. The data collectors were visiting three times each home if the mother is absent from her home to minimize the non-response rate.

## Study Variables

Dependent variable: knowledge, attitude towards HPV vaccine.

Independent variables: Socio-demographic factors and information about HPV vaccine (hearing or not).

## Operational Definitions

Mothers who have eligible daughters: mothers/guardians who have young daughters aged 14 years.

Knowledge: Knowledge score was computed by giving 1 for participants who correctly answered the questions and 0 for those who did not. It was measured using 13 item knowledge questions and categorized as "Poor knowledge" (0–7 out of 13 items), and "good Knowledge" (8–13 out of 13 items).<sup>5</sup>

Attitude: attitude score was computed by giving 1 for participants who correctly answered the questions and 0 for those who did not. It was measured using 12 item attitude questions and categorized as "negative attitude" (0–6 out of 12 items), and "positive attitude" (7–12 out of 12 items).<sup>5</sup>

## Data Collection Tool and Data Quality Control

A face-to-face interview-administered questionnaire was used to collect the data. Five health extension workers were the data collectors and one supervisor with BSc Degree who lives in Debre Markos town. The questionnaire consists of part one: socio-demographic, part two: source of information, part three: knowledge on HPV, and part four: attitude towards HPV vaccination adapted from different literature. The questionnaire was initially prepared in English and translated into Amharic and again back to English by professional translators to check for any inconsistencies. Finally, the Amharic version was used for the data collection. A pilot study was done 1 week before actual data collection by taking a sample of 5%<sup>31</sup> in Kebele 4. The reliability test for the data collection tool was checked and revealed the Cronbach alpha value of 0.789, and 0.7 for knowledge and attitude respectively.

Before data collection, to ensure the quality of the data two-day training were given to data collectors and supervisors. The collected data were checked for completeness.

## Data Processing and Analysis

The collected data were entered into Epi data version 3.1 and analysis was done using the SPSS version 25 statistical package. Descriptive statistics were used to describe the variable of the study. The bivariate and multivariate logistic regression models were fitted to identify the association between dependent and independent variables. All independent variables with P-value < 0.25 with knowledge, and attitude of HPV vaccine in binary logistic regression variables were transferred to multiple logistic regressions to adjust the effect of confounders and to differentiate the associated factors.

In the multivariable logistic regression model fitting, an adjusted odds ratio (AOR) with a 95% confidence interval (CI) was computed. A P-value less than 0.05 was considered to be statistically significant at 95% CI.

## Ethical Consideration

Before data collection, ethical clearance and an approval letter were taken from the Ethical Review Committee of Addis Ababa University College of Health Sciences, School of Nursing and Midwifery. Then a letter was written for Debre Markos town administrator and respective Kebele managers informed about the purpose of the research undertaking. Data collection was done after written voluntary consent was taken from each study participant. This study complies with the Declaration of Helsinki.

## Results

### Socio-Demographic Characteristics of the Respondents

The socio-demographic characteristics of the study participants were depicted in [Table 1](#).

A total of 601 study participants with a response rate of 100% were included in this study. The mean (SD) age of the respondents was 39.4 ( $\pm 8.95$ ) years and 477 (79.4%) were married, 509 (84.7%) were orthodox Christian, 227 (37.8%) were housewife, mean monthly income of the participants were 3022.85 ( $\pm 2607$ ) Ethiopian birr. The majority of the respondents 551 (91.7%) had less than or equal to five children and 530 (88.2%) had one daughter aged 9–14 years in the household.

### Source of Information

The majority of the respondents 381 (63.4%) heard about the HPV vaccine and from this for 274 (71.9%) respondents' main source of information about the HPV vaccine was television ([Figure 1](#)).

### Knowledge About the HPV Vaccine

About 315 (52.4%) of the respondents have poor knowledge about the HPV vaccine. Knowledge of respondents about HPV vaccine shows that 453 (75.4%) of parents expressed that they heard about CC, but only 258 (42.9%) of parents know CC is a disease of the genital tract, even only 179 (29.8%) of parents know that HPV can cause CC. More than half of the participants 399 (66.4%) did not know HPV is transmitted by sexual contact; 373 (62.1%) did not know the recommendation of HPV vaccine before the onset of sexual activity, and 65 (10.8%) of the parents reported that HPV vaccine is given only for women those who have multiple sexual partners ([Table 2](#)).

### Attitude Towards HPV Vaccine

The majority of the participants 465 (77.4%) had positive attitudes towards the HPV vaccine. From total study participants, 330 (54.9%) replied, they do not think their daughters are susceptible to HPV infection; 154 (25.6%) of mothers/guardians said HPV vaccine is not safe and effective; 195 (32.4%) of respondents think HPV vaccine will lead to complicated sexual activities; 272 (45.3%) of respondents think vaccinating their daughter against HPV will encourage them to start sexual activity and 203 (33.8%) of mothers/guardians believe HPV vaccine promotes risky sexual behaviors among teenagers ([Table 3](#)).

**Table I** Socio-Demographic Characteristics of Mothers/Guardians Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia, 2021 (n=601)

Variables	Category	Frequency	Percent (%)
Age in years	21–29	69	11.5
	30–39	269	44.7
	40–49	174	29
	50 and above	89	14.8
Marital status	Married	477	79.4
	Divorced	74	12.3
	Widowed	50	8.3
Maternal educational level	Cannot read and write	80	13.3
	Read and write only	79	13.2
	Primary school	92	15.3
	Secondary school	109	18.1
	Diploma	148	24.6
Religion	Degree and above	93	15.5
	Orthodox Christian	509	84.7
	Muslim	70	11.6
	Protestant	21	3.5
Maternal occupation	Others	1	0.2
	Civil servant	183	30.4
	Self-employed	14	2.3
	Merchant	153	25.5
	Farmer	8	1.3
	Housewife	227	37.8
Maternal monthly income	Others	16	2.7
	Less than 600	94	15.5
	601–1650	144	24
	1651–3200	156	26
	3201–5250	91	15.2
	5251–7800	74	12.3
	7801–10,900	36	6
	Above 10,900	6	1
Paternal occupation	Civil servant	214	44.9
	Self-employed	56	11.7
	Merchant	171	35.9
	Farmer	3	0.6
	Others	33	6.9
Paternal educational level	Cannot read and write	12	2.5
	Read and write only	38	8
	Primary school	70	14.7
	Secondary school	86	18
	Diploma	124	26
Paternal monthly income	Degree and above	147	30.8
	Less than 600	8	1.7
	601–1650	13	2.7
	1651–3200	84	17.6
	3201–5250	140	29.4
	5251–7800	113	23.7
	7801–10,900	105	22
Number of children in the household	Above 10,900	14	2.9
	Less than or equal to 5	551	91.7
	6 and above	50	8.3

(Continued)

**Table 1** (Continued).

Variables	Category	Frequency	Percent (%)
Number of daughters aged 9–14 years	One	530	88.2
	More than one	71	11.8

More than half of mothers/guardians 315 (52.4%) afraid of mild side effects of HPV vaccine for their daughter; 170 (28.3%) of respondents fear infertility from HPV vaccine for their daughter in the future, and 103 (17.1%) of respondents think only who are promiscuous would benefit from the vaccine. Table 3 shows the result of attitude towards HPV vaccine (Table 3).

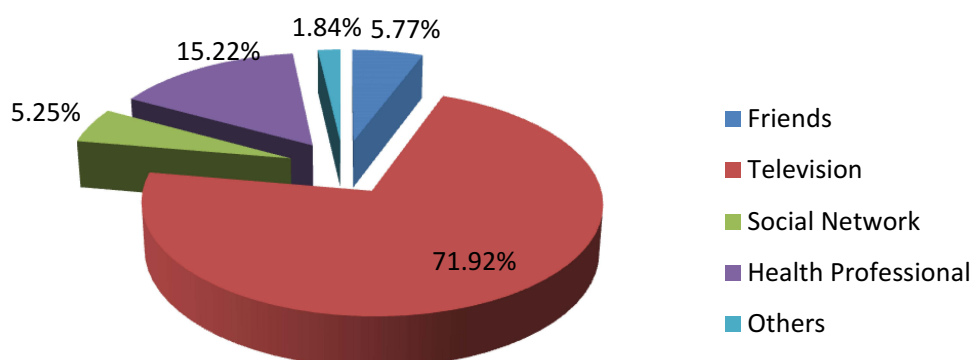
## Factors Associated with Knowledge About the HPV Vaccine

For bivariate logistic regression analysis, a total of thirteen variables were used and among these, eleven of the variables (maternal age, marital status, maternal educational level, maternal occupation, maternal monthly income, paternal occupation, paternal educational level, paternal monthly income, number of children in the household, hearing about the HPV vaccine and attitude) were all candidate variables for multivariable analysis. After controlling for confounders using the multivariate analysis model, maternal educational level, hearing about the HPV vaccine, and attitude towards HPV vaccine was significantly associated with knowledge about HPV vaccine (Table 4).

This study revealed that mothers who had a degree and above were about 8 times more likely to have good knowledge about HPV vaccine than mothers who cannot read and write (AOR=7.687; 95% CI=1.837–32.168;  $p=0.005$ ) and also mothers who had diplomas were about 4 times more likely to have good knowledge about HPV vaccine than mothers who cannot read and write (AOR=3.540; 95% CI=1.165–10.754;  $P=0.026$ ). Mothers who did not hear about the HPV vaccine before this study were about 82.8% less likely to have good knowledge about the HPV vaccine than mothers who heard about the HPV vaccine before this study (AOR=0.172; 95% CI=0.098–0.302;  $P=0.000$ ). Mothers who had a positive attitude towards the HPV vaccine were about 3 times more likely to have good knowledge about the HPV vaccine than mothers who had a negative attitude towards the HPV vaccine (AOR=2.959; 95% CI=1.580–5.539;  $P=0.001$ ) (Table 4).

## Factors Associated with Attitude Towards HPV Vaccine

For bivariate logistic regression analysis, a total of thirteen variables were used and among these, ten of the variables (maternal age, maternal educational level, religion, maternal occupation, maternal monthly income, paternal occupation, paternal educational level, number of daughters aged 9–14, hearing about HPV vaccine and knowledge about HPV vaccine). After controlling for confounders using the multivariate analysis model, hearing about the HPV



**Figure 1** The percentage distribution of sources of information about HPV vaccine among mothers/guardians who have eligible daughters in Debre Markos Town, Northwest Ethiopia, 2021.



**Table 2** Knowledge About HPV Vaccine Among Mothers/Guardians Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia, 2021 (n=601)

Items of Knowledge Questions	Response		
	Yes	No	Do Not Know
Ever heard about cervical cancer	453(75.4)	148(24.6)	
Cervical cancer is a disease of the genital tract	258(42.9)	202(33.6)	141(23.5)
HPV can cause cervical cancer	179(29.8)	81(13.5)	341(56.7)
HPV infections are preventable	426(70.9)	21(3.5)	154(25.6)
HPV is transmitted by sexual contact	202(33.6)	186(30.9)	213(35.4)
A vaccine against HPV infection does exist	440(73.2)	34(5.7)	227(21.1)
Vaccination against HPV is recommended before the onset of sexual activity	228(37.9)	84(14)	289(48.1)
HPV vaccine recommended preventing cervical cancer in the future	429(71.4)	48(8)	124(20.6)
The HPV vaccine can be offered to a female child aged 9–14 years old	350(58.2)	56(9.3)	195(32.4)
The HPV vaccine is only for women who have multiple sexual partners	65(10.8)	303(50.4)	233(38.8)
HPV vaccine requires 2 rounds of vaccination for daughters under 14 years	215(35.8)	30(5)	356(59.2)
The HPV vaccine can cause infertility	104(17.3)	306(50.9)	191(31.8)
Know HPV vaccine is given in schools	439(73)	162(27)	

**Table 3** Attitude Towards HPV Vaccine Among Mothers/Guardians Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia, 2021 (n=601)

Items of Attitude Questions	Response	
	Yes	No
Think your daughter is susceptible to HPV infection	271(45.1)	330(54.9)
Think HPV vaccine is safe and effective	447(74.4)	154(25.6)
Think being vaccinated for HPV reduce the risk of having HPV infection	518(86.2)	83(13.8)
Think HPV vaccine will not lead to complicated sexual activities	406(67.6)	195(32.4)
Vaccinating your daughter against HPV will not encourage them to start sexual activity	329(54.7)	272(45.3)
Think HPV vaccine promote risky sexual behaviors among teenagers	203(33.8)	398(66.2)
I would like to vaccinate my daughter against HPV if the vaccination is freely available.	497(82.7)	104(17.3)
Information on HPV helps me to decide whether my children should be vaccinated against HPV.	591(98.3)	10(1.7)
Afraid of mild side effects of HPV vaccine for your daughter (like pain and redness at the injection site)	315(52.4)	286(47.6)
Fear of infertility from HPV vaccine for your daughter in the future	170(28.3)	431(71.7)
Thinks HPV vaccine is effective in preventing cervical cancer	463(77)	138(23)
Thinks only those who are promiscuous would benefit from the vaccine	103(17.1)	498(82.9)

vaccine and knowledge about the HPV vaccine were significantly associated with attitudes towards the HPV vaccine (Table 5).

This study revealed that mothers who did not hear about the HPV vaccine before this study were about 71.5% less likely to have a positive attitude towards the HPV vaccine than mothers who heard about the HPV vaccine before this study (AOR=0.285; 95% CI=0.163–0.499; P=000). Mothers who had good knowledge about the HPV vaccine were about 3 times more likely to have a positive attitude towards the HPV vaccine than mothers who had poor knowledge about the HPV vaccine (AOR=2.705; 95% CI=1.454–5.035; 0.002) (Table 5).

## Discussion

The study was conducted to assess knowledge and attitude towards the HPV vaccine and associated factors among mothers who have eligible daughters in Debre Markos town. The finding of this study indicated that less than half of the respondents (47.6%) had good knowledge about the HPV vaccine. This finding is consistent with the study conducted in

**Table 4** Bivariable and Multivariable Analysis of Factors Associated with Knowledge About HPV Vaccination (n=601)

Variables	Category	Knowledge		COR (95% CI)	AOR (95% CI)	p-value
		Poor	Good			
Maternal age in years	21–29	37	32	1	1	0.026 0.005
	30–39	138	131	1.884(0.982,3.613)*	0.757(0.361,1.588)	
	40–49	79	95	2.068(1.245,3.435)*	1.147(0.511,2.573)	
	50 and above	61	28	2.620(1.530,4.486)*	1.056(0.383,2.913)	
Marital status	Married	238	239	1	1	
	Divorced	42	32	0.759(0.463,1.243)	0.872(0.465,1.636)	
	Widowed	35	15	0.427(0.227,0.802)*	0.590(0.257,1.358)	
Maternal educational level	Cannot read and write	67	13	1	1	
	Read and write only	62	17	1.413(0.635,3.147)	0.862(0.308,2.416)	
	Primary school	63	29	2.372(1.133, 4.968)*	1.399(0.524,3.741)	
	Secondary school	56	53	4.878(2.415, 9.850)*	2.473(0.940,6.503)	
	Diploma	52	96	9.515(4.805, 18.841)*	3.540(1.165,10.754)**	
Religion	Degree and above	15	78	26.800(11.907, 60.3210)*	7.687(1.837,32.168)**	
	Orthodox Christian	266	243	1		
	Muslim	39	31	0.870(0.526,1.438)		
	Protestant	9	12	1.460(0.604,3.524)		
Maternal occupation	Others	1	0	0.000(0.000,0.000)		
	Civil servant	44	139	1	1	
	Self-employed	9	5	0.176(0.056,0.552)*	0.335(0.043,2.596)	
	Merchant	92	61	0.210(0.131,0.335)*	1.596(0.497,5.124)	
	Farmer	6	2	0.106(0.21,0.542)*	6.269(0.606,64.860)	
	Housewife	153	74	0.153(0.099,0.237)*	1.057(0.300,3.726)	
Maternal monthly income	Others	11	5	0.144(0.047,0.437)*	0.563(0.083,3.818)	
	Less than 600	64	30	1	1	
	601–1650	95	49	1.100(0.632,1.915)	0.826(0.393,1.738)	
	1651–3200	104	52	1.067(0.617,1.843)	0.740(0.324,1.691)	
	3201–5250	23	68	6.307(3.321,11.980)*	2.213(0.644,7.613)	
	5251–7800	17	57	7.153(3.574,14.316)*	2.418(0.590,9.918)	
	7801–10,900	11	25	4.848(2.112,11.133)*	1.212(0.239,6.155)	
	Above 10,900	1	5	10.667(1.193,95.346)*	0.638(0.45,9.046)	
Paternal occupation	Civil servant	70	144	1	1	
	Self-employed	33	23	0.339(0.185,0.620)*	1.008(0.403,2.523)	
	Merchant	111	60	0.263(0.172,0.402)*	0.786(0.366,1.688)	
	Farmer	3	0	0.000(0.00,–)	0.000(0.000,0.000)	
	Others	21	12	0.278(0.129,0.597)*	1.078(0.329,3.536)	
Parental educational level	Cannot read and write	10	2	1	1	
	Read and write only	31	7	1.129(0.201,6.340)	0.642(0.088,4.701)	
	Primary school	48	22	2.292(0.463,11.349)	1.159(0.174,7.728)	
	Secondary school	54	32	2.963(0.610,14.384)*	0.978(0.154,6.231)	
	Diploma	55	69	6.273(1.319,29.820)*	1.557(0.237,10.224)	
	Degree and above	40	107	13.375(2.808,63.715)*	2.066(0.291,14.657)	
Paternal monthly income	Less than 600	7	1	1	1	
	601–1650	5	8	11.200(1.042,120.363)*	9.423(0.401,221.239)	
	1651–3200	53	31	4.094(0.481,34.857)*	2.918(0.168,50.583)	
	3201–5250	82	58	4.951(0.593,41.336)*	2.307(0.138,38.550)	
	5251–7800	53	60	7.925(0.944,66.525)*	1.228(0.069,21.727)	
	7801–10,900	33	72	15.273(1.805,129.216)*	1.570(0.087,28.208)	
	Above 10,900	5	9	12.600(1.186,133.892)*	1.089(0.046,25.788)	
Ever heard about the HPV vaccine	Yes	136	245	1	1	0.000
	No	179	41	0.127(0.085,0.189)*	0.172(0.098,0.302)**	

(Continued)



**Table 4** (Continued).

Variables	Category	Knowledge		COR (95% CI)	AOR (95% CI)	p-value
		Poor	Good			
Attitude	Negative attitude	103	33	1 3.725(2.417,5.740)*	1 2.959(1.580,5.539)**	0.001
	Positive attitude	212	253			

**Notes:** 1, reference category; \*candidate for multivariate at  $p < 0.25$ ; \*\* significance at  $p < 0.05$ .

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

Indonesia (44%)<sup>18</sup> and Brazil (51.79%).<sup>19</sup> However, this finding is higher than the studies done in Malaysia (38%)<sup>20</sup> and Sharjah (19%).<sup>21</sup> The discrepancy could be due to mothers those working in the medical field (health professionals) being excluded from the study conducted in Sharjah and the study conducted in Malaysia the questions were self-administer which may affect parents' responses related to questions clarity.

In the current study, nearly two-thirds of the study participants (63.4%) heard about the HPV vaccine. This finding is lower than a study done in Brazil (75.91%)<sup>19</sup> but higher than the studies conducted in Bangladesh (56%),<sup>22</sup> Nigeria (36.5%),<sup>23</sup> Arab Communities (26.1%),<sup>24</sup> Kazakhstani (52%),<sup>25</sup> and Lebanon (34%).<sup>26</sup> The possible explanation for these differences might be due to the difference in the access to information since the study in Nigeria is an institutional base.

The finding of this study showed that 71.9% of the respondent's main source of information about the HPV vaccine was television which is similar to a study done in the United Arab Emirates.<sup>21</sup> On the contrary, the finding of this study is higher than the studies conducted in Bangladesh (30%)<sup>22</sup> and Serbia (29.1%).<sup>27</sup> Their main source of information is newspapers for Bangladesh and health care providers for Serbia. The reason behind this difference might be due to the difference in socio-economic and socio-demographic variables.

The finding of the current study showed that only 29.8% of parents knew that HPV can cause cervical cancer. This finding is lower than studies done in Malaysia (86.8%),<sup>20</sup> Serbia (67.7%),<sup>27</sup> India (67.5%),<sup>28</sup> Indonesia (64.74%),<sup>29</sup> and Lebanon (34%).<sup>26</sup> This difference might be due to differences in study participants' level of education since the study in Malaysia the lower level of education was a primary school; in Indonesia, junior high school and convenience sampling were employed, and also in India, the study population was medical students.

One-third of participants (33.6%) knew HPV is transmitted by sexual contact. This finding is similar to a study conducted in Malaysia (32.8%)<sup>20</sup> but lower than studies conducted in Indonesia (52%),<sup>29</sup> Serbia (64.2%),<sup>27</sup> Brazil (82%),<sup>30</sup> and India (97.5%).<sup>28</sup> The possible reason might be the difference in the sample size, the study population, and the time of the study.

Nearly three-fourths of participants (73.2%) knew the presence of a vaccine against HPV infection which is similar to a study done in Serbia (67.7%).<sup>27</sup> This finding is in disagreement with a study done in Nigeria (18.9%).<sup>23</sup> This difference may be due to the introduction of the routine free HPV vaccination program at school in Ethiopia unlike in Nigeria which is given by cost.

In this study, 37.9% of respondents knew the recommendation of the HPV vaccine before the onset of sexual activity. This finding is similar to a study done in Serbia (43.3%).<sup>27</sup> However, our finding is higher than studies conducted in Ghana (21.7%),<sup>31</sup> and Indonesia (24%).<sup>29</sup> The possible reason might be the difference in study participants. Since both studies in Ghana and Indonesia includes males and females.

Likewise, 71.4% of the respondents knew the HPV vaccine prevents cervical cancer in the future. This finding is higher than studies done in Malaysia (31.8%),<sup>20</sup> India (55%),<sup>28</sup> and Ghana (55.9%).<sup>31</sup> The possible reasons might be due to the difference in sample size (ie the study done in Malaysia with a small sample size which is 280); time of the study (the study conducted in India among medical students immediately as the vaccine is introduced) and socio-demographic.

Greater than half (58.2%) of the respondents knew HPV vaccine recommended age for females which is higher than studies conducted in India on female medical students (35%),<sup>28</sup> and Indonesia (36.99%).<sup>29</sup> The reason for this variation

**Table 5** Bivariable and Multivariable Analysis of Factors Associated with Attitude Towards HPV Vaccination (n=601)

Variables	Category	Attitude		COR (95% CI)	AOR (95% CI)	p-value
		Neg.	Pos.			
Maternal age in years	21–29	9	60	1	1	
	30–39	66	203	0.461(0.217,0.980)*	0.483(0.199,1.175)	
	40–49	37	137	0.555(0.252,1.223)*	0.522(0.201,1.353)	
	50 and above	24	65	0.406(0.175,0.943)*	0.666(0.217,2.044)	
Maternal educational level	Cannot read and write	26	54	1	1	
	Read and write only	25	54	1.040(0.534,2.024)	0.824(0.327,2.073)	
	Primary school	20	72	1.733(0.877,3.426)*	1.374(0.547,3.454)	
	Secondary school	23	86	1.800(0.934,3.470)*	1.072(0.410,2.801)	
Maternal occupation	Diploma	32	116	1.745(0.948,3.212)*	0.912(0.281,2.960)	
	Degree and above	10	83	3.996(1.785,8.946)*	1.878(0.419,8.410)	
	Civil servant	32	151	1	1	
	Self-employed	6	8	0.283(0.092,0.870)*	0.671(0.114,3.958)	
Maternal monthly income	Merchant	44	109	0.525(0.313,0.881)*	1.715(0.454,6.488)	
	Farmer	1	7	1.483(0.176,12.480)	12.253(0.873,171.922)	
	Housewife	50	177	0.750(0.458,1.229)	2.691(0.646,11.210)	
	Others	3	13	0.918(0.247,3.410)	2.665(0.304,23.362)	
Paternal occupation	Less than 600	28	66	1	1	
	601–1650	36	108	1.273(0.712,2.276)	0.813(0.399,1.656)	
	1651–3200	34	122	1.522(0.850,2.727)*	1.565(0.679,3.612)	
	3201–5250	15	76	2.149(1.058,4.366)*	1.666(0.469,5.911)	
Paternal educational level	5251–7800	16	58	1.538(0.757,3.123)*	1.076(0.265,4.359)	
	7801–10,900	7	29	1.758(0.689,4.483)*	0.667(0.135,3.283)	
	Above 10,900	0	6	685,352,963.6(0.000,-)	177,590,985.78(0.000,0.000)	
	Civil servant	35	179	1	1	
Paternal monthly income	Self-employed	18	38	0.413(0.212,0.805)*	0.575(0.224,1.476)	
	Merchant	47	124	0.516(0.315,0.845)*	0.576(0.256,1.296)	
	Farmer	1	2	0.391(0.035,4.432)	0.599(0.038,9.518)	
	Others	10	23	0.450(0.197,1.027)*	0.492(0.155,1.561)	
Ever heard about the HPV vaccine	Cannot read and write	4	8	1	1	
	Read and write only	12	26	1.083(0.272,4.312)	0.873(0.185,4.120)	
	Primary school	21	49	1.167(0.317,4.300)	0.874(0.189,4.052)	
	Secondary school	22	64	1.455(0.399,5.307)	0.816(0.184,3.628)	
Knowledge	Diploma	30	94	1.567(0.441,5.571)	0.675(0.142,3.203)	
	Degree and above	22	125	2.841(0.788,10.248)*	0.799(0.151,4.218)	
	Less than 600	2	6	1	1	
	601–1650	6	7	0.389(0.056,2.697)		
Ever heard about the HPV vaccine	1651–3200	21	63	1.000(0.187,5.338)		
	3201–5250	39	101	0.863(0.167,4.461)		
	5251–7800	23	90	1.304(0.247,6.891)		
	7801–10,900	17	88	1.725(0.321,9.281)		
Knowledge	Above 10,900	3	11	1.222(0.158,9.467)		
	Yes	52	329	1	1	
	No	84	136	0.256(0.172,0.382)*	0.2850(0.163,0.499)**	
	Poor knowledge	103	212	1	1	
Knowledge	Good knowledge	33	253	3.725(2.417,5.740)*	2.705(1.454,5.035)**	0.002

**Notes:** \*Candidate for multivariate at  $p < 0.25$ ; \*\*Significance at  $p < 0.05$ .

**Abbreviations:** COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval; Neg., negative; Pos., positive.

may be this data was collected during the vaccine is given to daughters. So, this gives the mothers to have recent information. But other studies may face recall bias.

Greater than three-fourths of the participants (77.4%) had positive attitudes towards the HPV vaccine. This finding is found in the range of a systemic review done in southeast Asia (36.1–92.1)<sup>10</sup> But it is higher than studies conducted in Gonder town, Ethiopia which is (59.9%),<sup>5</sup> and India (69.07%).<sup>32</sup> The reason for this difference could be a difference in the study period since the study in Gonder is conducted as soon as the HPV vaccine is launched in Ethiopia.

The majority of the (74.4%) respondents believe that the HPV vaccine is safe and effective which is similar to a study done in Indonesia (75%).<sup>29</sup> On the other hand, it is higher than a study conducted in India (27%).<sup>15</sup> The reason for this difference might be a difference of study participants since the Indian study excludes single parents from the study.

Forty- five percent of respondents believed that vaccinating their daughter against HPV encourages them to start sexual activity. This finding is higher than a study done in Saudi (20%),<sup>33</sup> the reason for this variation might be due to the difference of study participants since the Saudi study was done on health professionals and convenience sampling was used.

In the current study, 77% of participants believed that the HPV vaccine is effective in preventing cervical cancer which is lower than a study conducted in Brazil (90.7%).<sup>30</sup> The possible reasons might be due to the difference in socio-economic, socio-demographic, and the study conducted in Brazil was with a small sample size (ie 219 participants).

The finding of this study shows that (52.4%) of participants were afraid of the mild side effect of HPV vaccination for their daughter which is greatly higher than a study conducted in Serbia (1.3%).<sup>27</sup> The possible cause for this difference might be the study conducted in Serbia was institutionally based and the participants were parents who have regular annual pediatric check-ups. This may give the participants information about HPV vaccine side effects.

The finding of the current study showed that maternal educational level, hearing about the HPV vaccine, and attitude of the mothers/guardians have an impact on knowledge of HPV vaccine of participants. Mothers who had a degree and above were about 8 times more likely to have good knowledge about HPV vaccine than mothers who cannot read and write (AOR=7.687; 95% CI=1.837–32.168;  $p=0.005$ ) and also mothers who had diplomas were about 4 times more likely to have good knowledge about HPV vaccine than mothers who cannot read and write (AOR=3.540; 95% CI=1.165–10.754;  $P=0.026$ ), which is similar to a study conducted in the United States,<sup>34</sup> and Nigeria.<sup>23</sup> This might also be justified that those who have higher educational levels and who heard about the HPV vaccine may know about the HPV vaccine by reading different sources.

The finding of the current study show hearing about the HPV vaccine and knowledge about the HPV vaccine was significantly associated with attitude towards the HPV vaccine. Mothers who did not hear about the HPV vaccine before this study were about 82.8% less likely to have good knowledge about the HPV vaccine than mothers who heard about the HPV vaccine before this study (AOR=0.172; 95% CI=0.098–0.302;  $P=0.000$ ) which is similar to a study done in Brazil.<sup>30</sup> Mothers who had good knowledge about the HPV vaccine were about 3 times more likely to have a positive attitude towards HPV vaccine than mothers who had poor knowledge about the HPV vaccine (AOR=2.705; 95% CI=1.454–5.035;  $0.002$ ), which is similar to a study done in India.<sup>35</sup> This justifies that knowing the HPV vaccine would bring behavioral change and also hearing about the vaccine triggers the participants to read and know more about the vaccine.

## Limitations of the Study

Since this study is used a cross-sectional study design. It does not show a true cause-effect relationship between dependent and independent variables. And also the information collected quantitatively was not triangulated with the qualitative method.

## Conclusions

Knowledge of mothers who have eligible daughters about the HPV vaccine was low. Maternal educational level, hearing about the HPV vaccine and attitude towards HPV vaccine were factors associated with knowledge about the HPV vaccine. Attitude towards HPV vaccine was high. Knowledge about the HPV vaccine and hearing about the HPV vaccine were factors associated with attitudes of mothers/ guardians towards the HPV vaccine.

An integrated work on behavioral change focusing on improving the knowledge about HPV vaccine; continuous health education at different places like schools, community level and through media to disseminate information regarding the importance of HPV vaccine the most effective strategies that should be considered by Debre Markos town health office with other non-governmental organizations working on health and health-related issues.

## Data Sharing Statement

All relevant data are within the paper. The datasets used and/or analyzed during the current study are available on reasonable request from the corresponding author.

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## Author Contributions

All authors of this study made a significant contribution to the conception, study design, execution, acquisition of data, analysis, and interpretation of the reported work, or in all these areas; took part in drafting, revising, or critically reviewing the article; 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 declare that they have no competing interests in this work.

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