Tanzania Journal of Health Research
Volume 24, Number 4, October 2023
https://dx.doi.org/10.4314/thrb.v24i4.4

Predictors of Human Papilloma Virus Knowledge and Vaccine acceptability among College Students of a private University

Agbesanwa Tosin Anthony[1*], Ayosanmi Oluwasola Stephen[2,] Oniyide Adesola A[3], Aina Felix O[4], Ibrahim Azeez O[5], Adegbilero-Iwari Oluwaseun E[6]

[1]*Department of Family Medicine, College of Medicine, Ekiti State University, Ado Ekiti*
[2]*University of Saskatchewan, College of Pharmacy and Nutrition, Saskatoon, SK, Canada*
[3]*Department of Physiology and Integrated General Medical, College of Medicine, Afe Babalola University, Ado Ekiti.*
[4]*Department of Family Medicine, College of Medicine, Ekiti State University, Ado Ekiti*
[5]*Department of Family Medicine, Federal Teaching Hospital, Ido Ekiti State, Nigeria*
[6]*Department of Community Medicine, College of Medicine and Health Sciences, Afe Babalola Univesity, Ado Ekiti*

Abstract

Objectives: In low to middle-income countries, 12% of all female cancers were attributed to Human papillomavirus (HPV) which is the leading infectious cause of malignancy globally. This study identified the predictors of HPV knowledge and vaccine acceptability among college students of a private university with a highlight of the influence of the Health Belief Model.

Methods: This was a cross-sectional study conducted among 388 students of a privately owned university using a stratified sampling technique. The questionnaire was designed to assess the predictors of HPV Knowledge and highlight how the Health Belief Model influenced vaccine acceptability.

Result: Respondents' perception of HPV screening benefits correlates positively ($r=0.45$, $p<0.001$) with vaccine acceptance. There is a negative weak correlation between the perception of HPV susceptibility and vaccine acceptability ($r= -0.06$, $p=0.215$). Predictors of overall knowledge of HPV infection include course of study, mother's employment status and good family health status. The predictors of HPV vaccine acceptability were moderate knowledge of HPV infection and course of study

Conclusion: Perceived benefits of HPV screening positively influence vaccine. The cues to action that influenced HPV knowledge include the choice of course of study, perception of good family health and mother's employment status. Perception of susceptibility to contracting HPV can be increased with better education and improved ways of counselling on the need for HPV screening, testing and vaccination.

Keywords; Predictors, Human papillomavirus, knowledge, vaccine acceptability, students.

Corresponding author: *Agbesanwa Tosin.A Email: tosinagbesanwa@gmail.com, tosin.agbesanwa@eksu.eksu.ng

Introduction

Human Papillomavirus (HPV) is the leading infectious cause of malignancy that contributes mainly to the high incidence and prevalence of cervical cancer globally (World Health Organization 2005; McCusker et al. 2013). Of the 12 high-risk strains of HPV, only types 16 and 18 are responsible for the majority of HPV-related cancers (Crosbie et al. 2013). HPV infections are sexually transmitted and are commonly established in the first decade of sexual activity among young women (Crosbie et al. 2013). HPV-related cancers include cervical cancers (CC) and vaginal, vulvar, anal, penile, oropharyngeal, and oral cancers. The incidence of cervical cancer remains a burden worldwide, especially in developing countries.

Worldwide, over 200 million women are infected with HPV DNA, of which type 16 or 18 or both accounted for 50% (World Health Organization 2022). A large proportion of those infected has been reported in low to middle-income countries where 12% of all female cancers were attributed to HPV (World Health Organization 2022). Eighty per cent of those affected with cervical cancers were found in developing countries (Cutts et al. 2007). Nigeria, a developing country has an increasing burden of cervical cancer ranking behind breast cancer as the leading cause of cancer burden with an estimate 14,943 cases and 10,400 deaths occurring in 2018 (Bray et al. 2018).

A prevalence rate of 23.7% has been reported among Nigerian women with HPV-related cervical cancer (Muñoz et al. 2022). The importance of primary and secondary prevention of HPV-related diseases has become a global point of advocacy for women and men (Lowy et al. 2008). Vaccination against HPV infection among adolescents and youths prior to their first sexual exposure has been emphasized as a preventive strategy for the occurrence of cervical cancers (Okunade et al. 2017). The two approved HPV vaccines – Gardasil and Cervarix have provided an opportunity to ensure the burden of cervical cancer is curbed (Okunade et al. 2017; Erickson, Alvarez, and Huh 2013). There are some variations about the age range of receiving the HPV vaccine. The World Health Organization recommends offering HPV vaccine to girls prior to their first sexual exposure, at the age of 9 to 13 years. The efficacy of the vaccine is better before exposure to the infection (World Health Organization 2009). Meanwhile, the Nigerian Federal Ministry of Health recommends the vaccination should be given between 9 to 26 years and before the initiation of sexual exposure (Federal Government of Nigeria n.d.).

Considering the education system in Nigeria, tertiary institution students have become a common focus of education about HPV vaccines (Okunade et al. 2017). This is because, it is believed that the risk of unprotected sexual intercourse tends to be higher due to the perceived freedom from parental supervision among this population. Also, there are reports of reduced knowledge of HPV and the need to receive this vaccination (Okunade et al. 2017; Oluwole et al. 2019). Many of these students lack the information about how they can engage in the primary prevention of cervical cancer through HPV vaccination. Hence, many previous studies had paid more attention to assessing the knowledge of students about HPV. However, there are few studies in Nigeria about vaccine acceptability among the students from tertiary institutions. The few studies on this subject in Nigeria sought to assess the knowledge of the students as a factor influencing their vaccine acceptability (Okunade et al. 2017; Oluwole et al. 2019).

While the knowledge base is a strong correlate of vaccine acceptability, the family structure and their perception about the vaccine may be additional factors that needs to be investigated. It may be interesting to know how the socioeconomic background of the students influence their vaccine acceptability considering the financial implication of HPV vaccination. Also, the parental influence and family dynamics could be influencing students' decisions to accept the vaccine. Additionally, the perception of the students about HPV-related diseases is important in understanding vaccine acceptability. The degree to which a student think they may be susceptible to HPV infection if

unvaccinated may play a role in their decision making. Perception of susceptibility have been shown to influence decisions relating to screening and prevention of infectious diseases (Ayosanmi et al. 2020; Johnson et al. 2008). Therefore, this study purposed to determine the predictors of HPV knowledge and vaccine acceptability among Nigerian college students.

Materials and methods

Design

This was a cross-sectional study conducted through self-administered questionnaires among health sciences' students of a privately owned tertiary institution.

Sample size

Sample size estimation was done using the Fisher's exact formula (Pourhoseingholi, Vahedi, and Rahimzadeh 2013). Using the acceptability rate of 74% obtained from a previous study (Idowu et al. 2019), 296 respondents was required to obtain a statistically significant data at a 95% confidence interval with a population of 1,263 participants (Bartlett, Kotrlik, and Higgins 2001). Using a stratified sampling technique, a proportional allocation was used to recruit 400 participants from the departments of medicine and surgery (MBBS), nursing and basic medical sciences. The students from three academic years (200-400 levels) were considered for the study. So, 243 (out of 770), 113 (out of 354) and 44 (out of 139) students were selected from MBBS, nursing and basic medical sciences, respectively. A total of 388 students responded giving a response rate of 97%. Only the Faculty of health sciences students of the privately owned university, who were unmarried were included in the study.

Study tools

The study instrument was adapted from a previous validated instrument (Sandfort and Pleasant 2009). The questionnaire was designed to highlight how two constructs of Health Belief Model (HBM) could influence vaccine acceptability. The Health Belief Model is a psychological model that makes attempt to predicts health related behavior in terms of certain belief pattern (Mckellar and Sillence 2020). The two constructs of the HBM chosen were perceived susceptibility and cues to action.

The perceived susceptibility was assessed using an attitudinal question asking *Currently I believe I have a high probability of contracting HPV infection.* The answers were dichotomized – agreed/disagreed. The cues to action were measured using variables that could have motivated the action to accept HPV vaccination. These variables include overall knowledge of the student about HPV, course of study, parental socioeconomic status, parental level of education, and family health rating. All these variables were measured with binary responses. Pilot testing was done among twenty medical students from a public institution with their responses excluded from the main survey. The pilot participants provided some feedback regarding the wordings and clarity of the questionnaire. Responses from the pilot testing were used to improve the wordings of the final survey and not added to the main survey sample size.

Study variables

The independent variables include participants' socio-demographic characteristics, history of family health. The dependent variables are HPV vaccine acceptability and perception of HPV susceptibility, overall knowledge of HPV and screening benefit.

Data Analysis

The data collected for the study were analyzed in the Statistical Package for Social Sciences (SPSS) version 23.0 for Windows, (IBM Corp., Armonk, N.Y., USA). Descriptive statistics using frequencies and percentage distribution were calculated for categorical variables. The Pearson correlation were used for bivariate analyses while the multivariate logistic regression was used for the multivariable analysis. P-value < 0.05 was considered statistically significant at 95% confidence interval.

 https://dx.doi.org/10.4314/thrb.v24i4.4

Ethical Approval

Participants consented to participate in the survey and none of the students required parental consent. All data collected were kept confidential and secured in a locker. The study was approved by the university research ethics review board with ethics number ABUADHREC 12/06/2022/87. The date of approval is 12/06/2022.

Results

Socio-demographic features of respondents

About 65% were more than 18 years, with a mean age of 18.2 ± 1.53. There are 377 females and 11 male participants. 93% of the students came from a monogamous family structure. The assessment of parental occupation shows that 91.2% of the fathers and 97.9% of the mothers were senior civil servants/professionals. University degree reported for 87.6% of the fathers and 87.1% of the mothers of the participants. Almost 97% of the students came from a family with high social class.

Table 1. Socio-demographic Characteristics of Respondents

Parameters	Frequency (*n*=388)	Percent
Age		
Less than 18	136	35.1
18 and above	252	64.9
Mean age	18.2±1.53	
Range	14, 27	
Family Background		
Monogamous	361	93.0
Polygamous	27	7.0
Course of Study		
Medicine and surgery (MBBS)	248	63.9
Basic medical sciences	49	12.6
Nursing	91	23.5
Religion		
Christianity	346	89.2
Islam	40	10.3
Traditional	2	0.5
Ethnic group		
Yoruba	160	41.2
Igbo	105	27.1
Hausa	15	3.9
Others	108	27.8
Father's Occupation		
Senior public servant, professional, large-scale traders	354	91.2
Intermediate grade public servant and Senior School Teachers	5	1.3
Junior school teacher, drivers, artisan	23	6.0
Petty traders, Laborers, messengers, and similar grades	2	0.5
Unemployed	4	1.0
Father's Education		
University graduate	340	87.6
HND/NCE	18	4.6
Secondary	25	6.5
Primary	2	0.5
No formal	3	0.8

 https://dx.doi.org/10.4314/thrb.v24i4.4

Mother's Occupation		
Senior public servant, professional, large-scale traders	380	97.9
Intermediate grade public servant and senior school teachers	2	0.5
Junior school teacher, drivers, artisan similar grades	1	0.3
Petty traders, laborers, messengers and similar grades	3	0.8
Unemployed	2	0.5
Mother's Education		
University graduate	338	87.1
HND/NCE	23	5.9
Secondary	10	2.6
Primary	8	2.1
No formal	9	2.3
Social class		
High	375	96.7
Middle	11	2.8
Low	2	0.5

Family Health Status

Over ninety percent (96.4%) of the respondents rated their family health status as very good while 99% reported no family history of cervical cancer. Almost eighty-five percent (84.8%) of the participants reported that their family health challenge is not sexually related. In addition, over thirty percent (31%) admitted a family history of non-cervical cancer. Over fifty-nine percent (59.5%) of those studied did Pap's smear text prior to the study.

Knowledge of Human Papilloma Virus Infection among Respondents

The Knowledge of human papillomavirus (HPV) infection among respondents is shown in table 2. Analysis of general knowledge items (total score of 19) revealed a mean score of 14.9(SD ± 2.4). Only 8 (2.1%) of the respondents got 100% correct responses for HPV knowledge. The Knowledge of HPV testing (total score of 6) showed a mean score of 3.4 (SD ± 1.1). Only 5 (1.3%) of the respondents got 100% correct responses for HPV testing. Also, a mean score of 5.4 (SD ± 1.4) was obtained for knowledge of HPV vaccination (total score of 7). 97 (25%) of the respondents got 100% correct responses for HPV vaccination.

Respondents' Overall Knowledge of Human Papillomavirus

The categorization of overall knowledge of HPV among the respondents was done with a score of 1 point for each correct response in Table 2 with either a 'true' or a 'false' thus obtaining a total score of 32 points. The overall HPV knowledge was subsequently scored into three groups ≤10 = poor score, 11-21 = moderate score; ≥22 good score. The mean of the overall knowledge score for human papillomavirus infection was 23.8 (SD ± 3.3). None of the respondents got 100% correct responses. A total of 309 (79.6%) respondents had a good knowledge level, 79 respondents (20.4%) had a moderate knowledge level while none of the respondents had poor knowledge level of HPV.

Table 2. Knowledge of Human Papilloma Virus Infection among Respondents

 https://dx.doi.org/10.4314/thrb.v24i4.4

	True n(%)	False n(%)
General Knowledge items		
HPV is very rare	117 (30.2)	271 (69.8)
HPV always has visible signs or symptoms	244 (62.9)	144 (37.1)
HPV can cause cervical cancer	333 (85.8)	55 (14.2)
HPV can be passed on by genital skin-to-skin contact	303 (78.1)	85 (21.9)
There are many types of HPV	327 (84.3)	61 (15.7)
HPV can cause HIV/AIDS	93 (24)	295 (76.0)
Human Papillomavirus (HPV) is a sexually transmitted infection that often cause cancers of various types	374 (96.4)	14 (3.6)
HPV is dangerous	375 (96.6)	13 (3.4)
HPV infection affects all these parts; male and the female genitalia, the anus, rectum, mouth and throat	333 (85.8)	55 (14.2)
HPV can be passed on during sexual intercourse	372 (95.9)	16 (4.1)
HPV can cause genital warts	353 (91)	35 (9.0)
Men cannot get HPV	70 (18)	318 (82.0)
Using condoms reduces the risk of getting HPV	312 (80.4)	76 (19.6)
HPV can be cured with antibiotics	121 (31.2)	267 (68.8)
Having many sexual partners increases the risk of getting HPV	369 (95.1)	19 (4.9)
HPV usually doesn't need any treatment	45 (11.6)	343 (88.4)
Most sexually active people will get HPV at some point in their lives	131 (33.8)	257 (66.2)
A person could have HPV for many years without knowing it	312 (80.4)	76 (19.6)
Having sex at an early age increases the risk of getting HPV	281 (72.4)	107 (27.6)
HPV Testing items		
An HPV test can tell how long you have had an HPV infection	292(75.3)	96(24.7)
If a woman tests positive for HPV she will definitely get cervical cancer	102(26.3)	286(73.7)
An HPV test can be done at the same time as a [Pap test/Smear test/Pap smear test	321(82.7)	67(17.3)
HPV testing is used to indicate if the HPV vaccine is needed	289(74.5)	99(25.5)
When you have an HPV test, you get the results the same day	152(39.2)	236(60.8)
If an HPV test shows that a woman does not have HPV, her risk of cervical cancer is low	289(74.5)	99(25.5)
HPV Vaccination items		
HPV vaccines require three doses	307(79.1)	81(20.9)
The HPV vaccines offer protection against all sexually transmitted infections	89(22.9)	299(77.1)
The HPV vaccines are most effective if given to people who have never had sex	270(69.6)	118(30.4)
Someone who has had HPV vaccine cannot develop cervical cancer	73(18.8)	315(81.2)
The HPV vaccines offer protection against most cervical cancers	288(74.2)	100(25.8)
One of the HPV vaccines offers protection against genital warts	324(83.5)	64(16.5)

 https://dx.doi.org/10.4314/thrb.v24i4.4

Girls who have had the HPV vaccine do not need a [Pap test/Smear test/Pap smear test] when they are older	89(22.9)	299(77.1)

Respondents' Attitude and Perception toward HPV

Only 15.5% of the respondents were perceived to be susceptible to HPV while about 39% accepted to be screened for HPV infection. Despite the high rated score in the overall knowledge assessment about HPV, over three-quarter of the participants feels that they don't have enough knowledge about the virus. About 75% of the respondents accepted to be vaccinated against HPV but almost 80% of them did not feel it is necessary to ask their partners to get vaccinated. Almost 90% of the participants would like to receive more information about HPV.

Table 3. Respondents' Attitude and Perception toward HPV

Statements	**Agree *n*(%)**	**Disagree *n*(%)**
Currently I believe I have a high probability of contracting HPV infection	60(15.5)	328(84.5)
I will like to get screened for HPV	151(38.9)	237(61.1)
I believe getting screened for HPV will be beneficial to my health	287(74)	101(26)
I have enough knowledge of HPV, HPV vaccination and prevention against HPV	91(23.5)	297(76.5)
I am willing to get vaccinated against HPV	290(74.7)	98(25.3)
It is not necessary asking my partner to get vaccinated against HPV	76(19.6)	312(80.4)
I will like to receive more information about HPV vaccination	347(89.4)	41(10.6)

Relationship between HPV Knowledge, Perception and Vaccine Acceptance

The relationship between respondents' knowledge and perception of HPV and vaccine acceptance is shown in table 4. Knowledge of HPV vaccination ($r=0.25$, $p<0.001$), general knowledge of HPV infection ($r=0.15$, $p=0.004$) and overall knowledge ($r=0.21$, $p<0.001$) showed weak positive correlations with HPV vaccine acceptability. Respondents' perception about HPV screening benefit correlates positively ($r=0.45$, $p<0.001$) with vaccine acceptance. However, there is a negative week correlation between the perception of HPV susceptibility and vaccine acceptability.

Table 4. Relationship between HPV Knowledge, Perception and Vaccine Acceptance

	HPV vaccine Acceptance	
	r	**p value**
Knowledge scores		
Knowledge of HPV Testing	0.02	0.648
Knowledge of HPV vaccination	0.25	<0.001*
General Knowledge of HPV infection	0.15	0.004*
Overall knowledge	0.21	<0.001*
Respondents' perception		
HPV Susceptibility	-0.06	0.215

 https://dx.doi.org/10.4314/thrb.v24i4.4

HPV screening benefit	0.45	<0.001*
Seriousness	0	0.997

r: correlation coefficient; *: Correlation is significant at p< 0.05

Table 5 below shows a bivariate logistic regression analysis of the predictors of vaccine acceptability and HPV infection knowledge. Identified predictors of the overall knowledge of HPV infection among participants were studying medicine and surgery (MBBS), mother's employment status, good rating for family health status, having family history of non-cervical cancer and not having a sexually transmitted infection affecting the family health. The predictors of HPV vaccine acceptability were moderate knowledge of HPV infection and course of study.

Table 5. Bivariate Predictors of HPV Knowledge and Vaccine acceptability

	HPV vaccine Acceptance			HPV Knowledge		
	Disagree	Agree	p value	Moderate	Good	p value
Socio-demographics						
Age						
less than 18	37(27.2)	99(72.8)	0.599[y]	27(19.9)	109(80.1)	0.96[y]
18 & above	61(24.2)	191(75.8)		52(20.6)	200(79.4)	
Gender						
Family background						
Monogamous	90(24.9)	271(75.1)	0.755[y]	72(19.9)	289(80.1)	0.619[y]
Polygamous	8(29.6)	19(70.4)		7(25.9)	20(74.1)	
Course of study						
MBBS	56(22.6)	192(77.4)	0.236	39(15.7)	209(84.3)	**0.004***
Nursing	26(28.6)	65(71.4)		23(25.3)	68(74.7)	
Basic medical	16(32.7)	33(67.3)		17(34.7)	32(65.3)	
Religion						
Christianity	88(25.4)	258(74.6)	0.968[y]	67(19.4)	279(80.6)	0.232
Others	10(23.8)	32(76.2)		12(28.6)	30(71.4)	
Ethnic group						
Yoruba	46(28.8)	114(71.3)	0.581	38(23.8)	122(76.2)	0.23
Igbo	23(21.9)	82(78.1)		22(21.0)	83(79.0)	
Hausa	3(20.0)	12(80.0)		4(26.7)	11(73.3)	
Others	26(24.1)	82(75.9)		15(13.9)	93(86.1)	
Father's Occupation						
Employed	98(25.5)	286(74.5)	0.576[f]	79(20.6)	305(79.4)	0.586[f]
Unemployed	0(0)	4(100.0)		0(0)	4(100.0)	
Father's Education						
Formal	98(25.5)	287(74.5)	0.575[f]	79(20.5)	306(79.5)	1.00[f]
No formal	0(0)	3(100)		0(0)	3(100)	
Mother's Occupation						
Employed	97(25.1)	289(74.9)	0.442[f]	77(19.9)	309(80.1)	**0.041*[f]**
Unemployed	1(50.0)	1(50.0)		2(100.0)	0(0.0)	
Mother's Education						
Formal	95(25.1)	284(74.9)	0.698[f]	77(20.3)	302(79.7)	1.00[f]
No formal	3(33.3)	6(66.7)		2(22.2)	7(77.8)	
Social class						
High	96(25.6)	279(74.4)	0.530[f]	76(20.3)	299(79.7)	0.733[f]
Others	2(15.4)	11(84.6)		3(23.1)	10(76.9)	

 https://dx.doi.org/10.4314/thrb.v24i4.4

Family Health						
I rate the state of my family Health status as very good						
Yes	95(25.74	279(74.6)	1.00[f]	71(19.0)	303(81.0)	**0.002*[f]**
No	3(21.4)	11(78.6)		8(57.1)	6(42.9)	
Ever had sexually transmitted disease						
Yes	3(30.0)	7(70.0)	0.718[f]	4(40.0)	6(60.0)	0.125f
No	95(25.1)	283(74.9)		75(19.8)	303(80.2)	
Never done Pap test before						
Yes	42(26.8)	115(73.2)	0.660[y]	34(21.7)	123(78.3)	0.694[y]
No	56(24.2)	175(75.8)		45(19.5)	186(80.5)	
Family history of cervical cancer						
Yes	2(50.0)	2(50.0)	0.266[f]	2(50.0)	2(50.0)	0.186[f]
No	96(25.0)	288(75.0)		77(20.1)	307(79.9)	
Family history of non-cervical cancer						
Yes	31(25.6)	90(74.4)	1.00[y]	33(27.3)	88(72.7)	**0.032*[y]**
No	67(25.1)	200(74.9)		46(17.2)	221(82.8)	
The health challenge of my family is not sexually related						
Yes	82(24.9)	247(75.1)	0.846[y]	60(18.2)	269(81.8)	**0.023*[y]**
No	16(27.1)	43(72.9)		19(32.2)	40(67.8)	
Overall Knowledge level						
Moderate	34(43)	45(57)	**<0.001*[y]**			
Good	64(20.7)	245(79.3)				
Course of Study						
MBBS	27(7.0)	221(57.0)	**0.004**			
Nursing	22(5.7)	69(17.8)				
Basic medical	11(2.8)	38(9.8)				
Perceived HPV Screening benefit						
Agree	39(13.6%)	248(86.4%)	**0.000**			
Disagree	59(58.4%)	42(41.6%)				

[y]: Yate's correction; f: Fisher's exact test; *:p<0.05

Logistic Regression Models

In order to isolate cofounders, significant factors at the bivariate analyses (tables 4 and 5) were inserted into two different logistic regression models (models 1 and 2), presented in Table 6. Perceived HPV screening benefit influenced HPV vaccine acceptance (AOR: 7.63; 95% CI: 4.46 – 13.06) among the students. Medical students (MBBS) were twice more likely to have good overall knowledge of HPV infection testing and vaccination than basic medical students (AOR: 2.35; 95% CI: 1.15 – 4.80). Similar results held for students with no family history of non-cervical cancer (AOR: 1.98; 95% CI: 1.15 – 3.40) and non-sexually related family health challenge (AOR: 2.13; 95% CI: 1.11 – 4.09). Also, students who rated their family health status as good (AOR: 4.82; 95% CI: 1.56 - 14.96) were more likely to have better knowledge of HPV infection than those who did not.

Table 6. Predictors of HPV infection Knowledge and Vaccine Acceptance

Variables	**B**	**p value**	**AOR**	**95% C.I.**	
				Lower	**Upper**
Model 1- HPV Vaccine Acceptance					

 https://dx.doi.org/10.4314/thrb.v24i4.4

Knowledge of HPV vaccination	0.20	0.074	1.22	0.98	1.52
General knowledge of HPV infection	0.04	0.612	1.04	0.90	1.20
Perceived benefit of HPV screening	2.03	**<0.001***	7.63	4.46	13.06
Overall knowledge level (good)	0.45	0.339	1.56	0.63	3.90
Model 2- HPV infection overall knowledge					
MBBS	0.86	**0.019***	2.35	1.15	4.80
Nursing	0.40	0.321	1.49	0.68	3.29
Basic medical [ref]					
Mother's occupation (employed)	23.09	0.999	1.1×10^{10}	0	-
I rate my family health status as very good (yes)	1.57	**0.006***	4.82	1.56	14.96
Family history of non-cervical cancer (No)	0.68	**0.013***	1.98	1.15	3.40
The health challenge of my family is not sexually related (yes)	0.76	**0.023***	2.13	1.11	4.09

B: Coefficient of regression; [ref]: reference category; *: p value < 0.05; AOR: Adjusted odds ratio; 95% CI: 95% Confidence interval

Discussion

The knowledge of HPV infection, knowledge of HPV vaccination, perception of HPV screening benefit correlates with vaccine acceptability. However, there is a negative week correlation between the perception of HPV susceptibility and vaccine acceptability. Identified predictors of the overall knowledge of HPV infection among participants were course of study, mother's employment status, good rating for family health status, having family history of non-cervical cancer and not having a sexually transmitted infection affecting the family health. The predictors of HPV vaccine acceptability were moderate knowledge of HPV infection and course of study

The study assessed the predictors of human papilloma virus knowledge and vaccine acceptability among college students in a south-western Nigeria privately owned institution. The correction rates of HPV knowledge ranged from 33.8% to 96.6%. This is higher than what was found among university students in Korea (Kim and Ahn 2007). The difference may be attributable to the limitation of the study in Korea to only nursing students. In addition to this, the depth of teaching and subsequent knowledge about infectious diseases may be higher among medical students than their nursing counterpart. Sandfort and Pleasant reported insufficient understanding of the HPV knowledge in some important aspect among college student (Sandfort and Pleasant 2009). The lack of good understanding of HPV infection may be the reason why a large proportion of our respondents falsely responded that HPV always has visible signs and symptoms.

The finding of over 50% of students who had done Pap's smear was higher than what was found in South Africa where less than 10% did Pap's smear among the university students studied (Hoque and Hoque 2009). The ease of affording the investigation and possible high educational level of affluent parents of students in privately owned university may be responsible for this. It is not uncommon to expect children of parents in high socioeconomic class to rate their family health status as good. Their parents' had the capacity to pay for maintaining good health.

The finding of over 75% vaccine acceptability was similar to what was reported in some other studies (Cunningham, Davison, and Aronson 2014; Idowu et al. 2019; Z. Iliyasu et al. 2010; Ndikom and Oboh 2017). The high rate of vaccine acceptability may not be unconnected with the fear of developing cancer of the cervix in future. This is similar to what was reported among medical students in the Northern state of Nigeria (Idowu et al. 2019). In this study, a good overall knowledge score of HPV also

 https://dx.doi.org/10.4314/thrb.v24i4.4

related significantly with vaccine acceptability. Perhaps an exposure to adequate knowledge of HPV had a positive influence on students' desire to seek for preventive measures

The low perception of susceptibility to contracting HPV infection.in this study is similar to what was reported among college students in the United State of America (Barnard et al. 2017). The high knowledge of HPV infection in this study did not influence the attitudes of the students in their perceptive susceptibility to contracting HPV infection. This might be an indication that the knowledge acquired might influence a desire to seek for preventive measures but may not affect their behaviour and practice. Thus the need for personal counseling on the dangers of HPV infection. Those with positive perception of their susceptibility to contracting HPV infection related significantly with course of study. This may be attributed to the depth of teaching received by the medical students as against that of the other students.

It was found that medical students were twice more likely to have good overall knowledge of HPV infection testing and vaccination than the nursing and basic medical students. On the contrary, a study done among medical students by Iliyasu et al in the Northern Nigeria reported that majority of their participants had poor knowledge of HPV (Zubairu Iliyasu et al. 2022). This difference may be attributed to the difference in the students recruited by iliyasu et al who were dental students and allied health workers whose level of exposure to teaching on HPV infection may be minimal.

The perceived benefit of HPV vaccination, a good knowledge of HPV infection and vaccination had significant relationship with vaccine acceptability. This has been reported in studies that vaccine hesitancy is greatly influenced by ignorance and perceived danger (Doornekamp et al. 2020; Rey et al. 2018). Good perception of HPV screening benefit and high level of willingness to get vaccinated in this study may be a reflection of how adequate knowledge often influenced cue to action in people. In addition to this, a large proportion of the students showed seriousness in getting more information about HPV vaccination. This may indicate the acceptance that adequate knowledge was still needed by the students studied. Inadequate information have been noted to be the major reasons behind low HPV vaccine acceptability (Adejuyigbe et al. 2015).

The employment status of mothers was significantly related with HPV knowledge among the students. This was corroborated by documented report of children of employed mothers who showed higher socio-emotional outcome and cognitive scores (Salimiha, Perales, and Baxter 2018). The status of the students' family health was also observed to be significantly associated with HPV knowledge. The family that is concerned about their health will likely spend more time to seek knowledge about conditions that may affect them adversely. Furthermore, it was also discovered that the students from families with history of non-cervical cancer and those with family health challenge that are not sexually related have significant relationships with good HPV knowledge. Health seeking behavior has been reported to be influenced by multifaceted factors which include physical, socio-economic, cultural and political contexts (Shaikh and Hatcher 2005).

In conclusion, this research revealed that having a good knowledge of HPV infection may not necessarily translate to students taking precautionary measures against contracting the disease. Vaccine acceptability can be increased if more efforts is devoted to adequate knowledge of HPV infection, screening benefit and students' engagement in medical studies. Medically related courses, mother's employment status, good rating of students' family health status all contribute to increased overall knowledge of HPV. The low perception of susceptibility to contracting HPV can be increased with improved education and counseling about HPV knowledge, screening and testing. This study was done among medically inclined students so the findings may not be used as criteria to judge the knowledge base of HPV infection and vaccine acceptability in the general population.

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest
The authors declare no conflict of interest.

Author Contribution
ATA – Conceptualization, Original draft, Review, Editing, Data Curation, Formal Analysis, Fund acquisition, Investigation, Project Administration, Methodology, validation, visualization and supervision
AOS - Conceptualization, Original draft, Review of manuscript, Editing and reconstruction of the manuscript.
OAA - Original draft, Review, Editing, Fund acquisition, Investigation, Project Administration, validation, visualization and supervision
AFO - Original draft, Review, Editing, Data Curation, Formal Analysis, Fund acquisition, Investigation, Project Administration, validation, visualization and supervision
IAO - Original draft, Review, Editing, Fund acquisition, Investigation, Project Administration, validation, visualization and supervision
A-I OE - Original draft, Review, Editing, Fund acquisition, Investigation, Project Administration, validation, visualization and supervision.

References

Adejuyigbe, Funmilayo F., M. R. Balogun, Balogun R. Balogun, Adekemi O. Sekoni, and Adebukola A. Adegbola. 2015. "Cervical Cancer and Human Papilloma Virus Knowledge and Acceptance of Vaccination among Medical Students in Southwest Nigeria." *African Journal of Reproductive Health* 19, no. 1 (March): 140–48.

Ayosanmi, OS, L Oden, T Ayosanmi, B Alli, M Wen, and J Johnson. 2020. "The Role of Health Belief Model in HIV Screening Decision among International Students in the United States: A Pilot Study." *International Journal of Translational Medical Research and Public Health* 12, no. 4: 4–12.

Barnard, Marie, Phillis George, Mandy Perryman, and Lori Wolff. 2017. "Human Papillomavirus (HPV) Vaccine Knowledge, Attitudes, and Uptake in College Students: Implications from the Precaution Adoption Process Model." *PLoS ONE* 12, no. August (August). https://doi.org/10.1371/journal.pone.0182266.

Bartlett, James E, Joe W Kotrlik, and Chadwick C Higgins. 2001. "Organizational Research: Determining Appropriate Sample Size in Survey Research." *Information Technology, Learning and Performance Journal* 19, no. 1: 43–50.

Bray, Freddie, Jacques Ferlay, Isabelle Soerjomataram, Rebecca L. Siegel, Lindsey A. Torre, and Ahmedin Jemal. 2018. "Global Cancer Statistics 2018: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries." *CA: A Cancer Journal for Clinicians* 68, no. 6 (November): 394–424. https://doi.org/10.3322/caac.21492.

Crosbie, Emma J., Mark H. Einstein, Silvia Franceschi, and Henry C. Kitchener. 2013. "Human Papillomavirus and Cervical Cancer." *Lancet (London, England)* 382, no. 9895 (September): 889–99. https://doi.org/10.1016/S0140-6736(13)60022-7.

Cunningham, Melissa S., Colleen Davison, and Kristan J. Aronson. 2014. "HPV Vaccine Acceptability in Africa: A Systematic Review." *Preventive Medicine* 69, no. December (December): 274–79. https://doi.org/10.1016/j.ypmed.2014.08.035.

Cutts, F. T., S. Franceschi, S. Goldie, X. Castellsague, S. de Sanjose, G. Garnett, W. J. Edmunds, et al. 2007. "Human Papillomavirus and HPV Vaccines: A Review." *Bulletin of the World Health Organization* 85, no. 9 (September): 719. https://doi.org/10.2471/BLT.06.038414.

Doornekamp, Laura, Leanne van Leeuwen, Eric van Gorp, Helene Voeten, and Marco Goeijenbier. 2020. "Determinants of Vaccination Uptake in Risk Populations: A Comprehensive Literature Review." *Vaccines* 8, no. 3 (September): 480. https://doi.org/10.3390/vaccines8030480.

Erickson, Britt K., Ronald D. Alvarez, and Warner K. Huh. 2013. "Human Papillomavirus: What Every Provider Should Know." *American Journal of Obstetrics and Gynecology* 208, no. 3 (March): 169–75. https://doi.org/10.1016/j.ajog.2012.09.007.

Federal Government of Nigeria. n.d. "National Cancer Control Plan: 2018 – 2022." Federal Government of Nigeria. Accessed September 3, 2022. https://www.iccp-portal.org/system/files/plans/NCCP_Final%20%5B1%5D.pdf.

Hoque, E, and M Hoque. 2009. "Knowledge of and Attitude towards Cervical Cancer among Female University Students in South Africa." *Southern African Journal of Epidemiology and Infection* 24, no. 1 (January): 21–24. https://doi.org/10.1080/10158782.2009.11441335.

Idowu, Ajibola, Samuel Olowookere, Oluseyi Israel, and Adebowale Akinwumi. 2019. "Human Papillomavirus Vaccine Acceptability and Uptake among Medical and Paramedical Students of a Nigerian Tertiary Health Institution," July (July).

Iliyasu, Z., I. S. Abubakar, M. H. Aliyu, and H. S. Galadanci. 2010. "Cervical Cancer Risk Perception and Predictors of Human Papilloma Virus Vaccine Acceptance among Female University Students in Northern Nigeria." *Journal of Obstetrics and Gynaecology*, December (December). https://www.tandfonline.com/doi/abs/10.3109/01443615.2010.511724.

Iliyasu, Zubairu, Hadiza S. Galadanci, Aisha Muhammad, Bilkisu Z. Iliyasu, Amina A. Umar, and Muktar H. Aliyu. 2022. "Correlates of Human Papillomavirus Vaccine Knowledge and Acceptability among Medical and Allied Health Students in Northern Nigeria." *Journal of Obstetrics and Gynaecology* 42, no. 3 (April): 452–60. https://doi.org/10.1080/01443615.2021.1910639.

Johnson, CE, KE Mues, SL Mayne, and AN Kiblawi. 2008. "Cervical Cancer Screening among Immigrants and Ethnic Minorities: A Systematic Review Using the Health Belief Model." *Journal of Lower Genital Tract Disease* 12, no. 3: 232–41.

Kim, HW, and HY Ahn. 2007. "Study on the Knowledge of Human Papilloma Virus in Female University Students." *Korean J Women Health Nurs* 13, no. 1: 13–20.

Lowy, Douglas R., Diane Solomon, Allan Hildesheim, John T. Schiller, and Mark Schiffman. 2008. "Human Papillomavirus Infection and the Primary and Secondary Prevention of Cervical Cancer." *Cancer* 113, no. 7 Suppl (October): 1980–93. https://doi.org/10.1002/cncr.23704.

McCusker, Sarah M., Ishbel Macqueen, Graham Lough, Alasdair I. MacDonald, Christine Campbell, and Sheila V. Graham. 2013. "Gaps in Detailed Knowledge of Human Papillomavirus (HPV) and the HPV Vaccine among Medical Students in Scotland." *BMC Public Health* 13, no. March (March): ARTN 264. https://doi.org/10.1186/1471-2458-13-264.

Mckellar, Kerry, and Elizabeth Sillence. 2020. "Current Research on Sexual Health and Teenagers." In *Teenagers, Sexual Health Information and the Digital Age*, 5–23. Elsevier. https://doi.org/10.1016/B978-0-12-816969-8.00002-3.

Muñoz, J, L Bruni, G Albero, B Serrano, M Mena, JJ Collado, D Gómez, FX Bosch, and S de Sanjosé. 2022. "Human Papillomavirus and Related Diseases in Nigeria. Summary Report 22 October 2021."

ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre). https://hpvcentre.net/statistics/reports/NGA.pdf.

Ndikom, C. M., and P. I. Oboh. 2017. "Perception, Acceptance and Uptake of Human Papillomavirus Vaccine among Female Adolescents in Selected Secondary Schools in Ibadan, Nigeria." *African Journal of Biomedical Research* 20, no. 3 (December): 237–44. https://doi.org/10.4314/ajbr.v20i3.

Okunade, Kehinde S., Oyebola Sunmonu, Gbemisola E. Osanyin, and Ayodeji A. Oluwole. 2017. "Knowledge and Acceptability of Human Papillomavirus Vaccination among Women Attending the Gynaecological Outpatient Clinics of a University Teaching Hospital in Lagos, Nigeria." *Journal of Tropical Medicine* 2017, no. December (December): e8586459. https://doi.org/10.1155/2017/8586459.

Oluwole, Esther O., Oluwaseun M. Idowu, Adebola A. Adejimi, Mobolanle R. Balogun, and Gbemisola E. Osanyin. 2019. "Knowledge, Attitude and Uptake of Human Papillomavirus Vaccination among Female Undergraduates in Lagos State, Nigeria." *Journal of Family Medicine and Primary Care* 8, no. 11 (November): 3627–33. https://doi.org/10.4103/jfmpc.jfmpc_520_19.

Pourhoseingholi, Mohamad Amin, Mohsen Vahedi, and Mitra Rahimzadeh. 2013. "Sample Size Calculation in Medical Studies." *Gastroenterology and Hepatology From Bed to Bench* 6, no. 1: 14.

Rey, Dominique, Lisa Fressard, Sébastien Cortaredona, Aurélie Bocquier, Arnaud Gautier, Patrick Peretti-Watel, Pierre Verger, and on behalf of the Baromètre santé 2016 Group. 2018. "Vaccine Hesitancy in the French Population in 2016, and Its Association with Vaccine Uptake and Perceived Vaccine Risk–Benefit Balance." *Eurosurveillance* 23, no. 17 (April): 17. https://doi.org/10.2807/1560-7917.ES.2018.23.17.17-00816.

Salimiha, Amir, Francisco Perales, and Janeen Baxter. 2018. "Maternal Employment and Children's Socio-Emotional Outcomes: An Australian Longitudinal Study." *International Journal of Public Health*. https://doi.org/10.1007/s00038-018-1132-4.

Sandfort, Jessica R., and Andrew Pleasant. 2009. "Knowledge, Attitudes, and Informational Behaviors of College Students in Regard to the Human Papillomavirus." *Journal of American College Health* 58, no. 2 (September): 141–49. https://doi.org/10.1080/07448480903221368.

Shaikh, B. T., and J. Hatcher. 2005. "Health Seeking Behaviour and Health Service Utilization in Pakistan: Challenging the Policy Makers." *Journal of Public Health* 27, no. 1 (March): 49–54. https://doi.org/10.1093/pubmed/fdh207.

World Health Organization. 2005. "Report of the Consultation on Human Papillomavirus Vaccines." World Health Organization. http://apps.who.int/iris/bitstream/handle/10665/69150/WHO_IVB_05.16.pdf?sequence=1.

———. 2009. "Human Papillomavirus Vaccines : WHO Position Paper = Vaccins Anti-Papillomavirus Humain : Note d'information de l'OMS." *Weekly Epidemiological Record = Relevé Épidémiologique Hebdomadaire* 84, no. 15: 118–31.

———. 2022. "Cervical Cancer." World Health Organization. https://www.who.int/news-room/fact-sheets/detail/cervical-cancer.