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Knowledge, Perception and Uptake of the Human Papilloma Virus Vaccination among Female Undergraduates in a Nigerian Private University

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Abstract

Context: Nigeria had a cervical cancer incidence rate of 26.2 cases per 100, 000 women as of 2022. The Human Papilloma Virus (HPV) is responsible for over 99% of cervical cancer cases, and vaccination is safe and effective for its prevention and control.
Objective: This study aimed to determine the knowledge, perception, and uptake of HPV vaccination among female undergraduates of Babcock University, Ogun State, Nigeria.
Materials and Methods: It was a descriptive cross-sectional study with 300 female undergraduates. The instrument was a pretested, self-administered questionnaire. Univariate analysis was used to present the knowledge, perception and uptake of HPV vaccination, as well as the reasons for non-vaccination (barriers); while bivariate analysis (Chi-Square) was used to test for associations. The significance level was set at $p < 0.05$.
Results: Majority (82%) of the respondents hmd good knowledge of the HPV vaccination, while 57.7% had good perception of the HPV vaccination. However, only 17.7% of respondents had been vaccinated, and only 2% had completed 3 doses of the vaccine. Barriers to vaccination were non-availability (26.7%), cost (24.3%) and safety concern (22.3%). The level of study was significantly associated with the knowledge ($p=0.027$), perception ($p<0.001$) and uptake of the HPV vaccination ($p=0.003$), while age was significantly associated with the knowledge ($p=0.045$) and perception of HPV vaccination ($p=0.043$).
Conclusion: The knowledge and perception of the HPV vaccination among the participants were good and fair respectively, but the uptake was low. There is a need for sustained health education, availability and affordability of the HPV vaccines.

Keywords: HPV, Vaccination, Female, Undergraduates, Knowledge, Perception, Uptake.

Introduction

Globally, cervical cancer is regarded as the fourth most common cancer in women, accounting for 660, 000 new cases and 350, 000 fatalities as of 2022.[1] However, low-and-middle-income countries (LMICs) bear the highest global burden of the new cases of cervical cancer and its mortality due to limited availability and access to the Human Papilloma Virus (HPV) vaccines and screening, inadequate healthcare infrastructure, as well as cultural and socioeconomic barriers to early diagnosis and prompt, effective treatment.[1]

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As of 2022, the three countries with the highest age standardized incidence rates of cervical cancer per 100, 000 women worldwide were Eswatini (95.9), Zambia (71.5), and Malawi (70.9); while Nigeria had an age standardized cervical cancer incidence rate of 26.2 per 100, 000 women.2 These rates were much higher than the global age standardized incidence rate of cervical cancer which was 14.1 per 100,000 women.[2]

Similarly, as of 2022, the three countries that had the highest age standardized death rates per 100,000 women due to cervical cancer globally were Tanzania (42.2), Democratic Republic of Congo (24.6), and South Africa (19.0); while Nigeria recorded an age standardized death rate of 14.3 due to cervical cancer.[2] These rates were also higher than the global age standardized death rate due to cervical cancer per 100, 000 women which was 7.1.2

About 99.7% of the cases of cervical cancer are caused by the Human Papilloma Virus (HPV),[3] while two high-risk types, HPV 16 and HPV 18 are responsible for over 70% of cervical cancer cases.[4] The risk factors for cervical cancer include early sexual debut, having multiple sexual partners, having a weakened immune system (especially due to HIV), and smoking (first-hand/active and second-hand/passive).[4]

Vaccination against HPV is a safe and effective way to achieve primary prevention of cervical cancer. It is most protective if it is given before sexual debut; hence, the recommendation that it should be given to girls (and even boys) between the ages of 9 to 14 years.[5] The vaccine protects against most of the common types of HPV that cause cervical cancer, and can offer up to 90% protection against cervical cancer if it is given before an individual is exposed to the virus.[5]

According to the WHO, there are currently 6 licensed HPV vaccines and they include 3 bivalent vaccines (against HPV types 16 and 18), 2 quadrivalent vaccines (against HPV types 6, 11, 16 and 18), and one nonavalent vaccine (against HPV types 6, 11, 16, 18, 31, 33, 45, 52 and 58).[6] In addition to cervical cancer, HPV vaccination can also protect against other types of cancer caused by HPV such as cancer of the throat, vulva, vagina, penis and the anus.[5] The vaccine dosage recommendation is that persons initiating vaccination between 9 years and 14 years should receive 2 doses of the vaccine, while persons initiating vaccination between 15 years and 45 years should receive 3 doses of the vaccine.7

In October 2023, Nigeria introduced the HPV vaccination into its routine National Programme on Immunization (NPI) schedule.[8] The objective was to vaccinate girls between the ages of 9 years and 14 years against cancer-causing HPV strains, especially types 16 and 18.8 The vaccine is provided by the Federal Ministry of Health through the National Primary Health Care Development Agency (NPHCDA), with support from the WHO, UNICEF, and Gavi, the Vaccine Alliance.[8]

Female undergraduates in different parts of the world have shown varied knowledge, perception and uptake of the HPV vaccination. A study carried out among participants drawn from six universities in China revealed that the uptake rate of HPV vaccination was 18.11%, while 40.19% were willing to get vaccinated; barriers to the HPV vaccination were safety concern and cost.9 Another study in Indonesia reported that 68% of participants had good knowledge of the HPV vaccination, while 95.8% were willing to get vaccinated; barriers to vaccination included inadequate information and cost.[10] A related study done in the United States reported that while 47% of the respondents had received at least one dose of the HPV vaccine, only 17.4% had completed the recommended three doses.[11]

Studies in Africa have also reported various levels of knowledge, perception and uptake of the HPV vaccination among female undergraduates. A study in Ethiopia reported that 52.5% and 57% of respondents had good knowledge and good perception of the HPV vaccines respectively.[12] Another study in South Africa revealed that 9.7% of participants had good knowledge of the HPV vaccines; 13.4% had been vaccinated; 19.1% were unwilling to get vaccinated; while barriers to vaccination included lack of adequate information about the vaccine and concern about safety.[13]

However, another South African study reported a higher level of good knowledge of the HPV vaccines at 67.9%.[14] Similarly, a Moroccan study that involved female undergraduates in six universities reported that 7.8% of participants had good knowledge of the HPV vaccines, and less than

1% had received the vaccine; however, 67% were willing to be vaccinated.[15] Also, a related study carried out in Ghana revealed that while 39.8% of the participants had adequate knowledge of HPV vaccines, only 13% had received at least one dose of the HPV vaccine, and barriers to vaccination included inadequate knowledge of the vaccines and concerns about the safety and efficacy of the vaccines.[16]

Studies conducted among female undergraduates in Nigeria have revealed a low knowledge of the HPV vaccines, negative attitude towards the vaccines, and a low uptake of the vaccines. For instance, a study carried out among female undergraduates in north-central Nigeria reported that 31.8% of the respondents had good knowledge of the HPV vaccines; only 15% had taken at least a dose of the vaccine; while 7.6% had completed the 3 vaccine doses.[17]

Another Nigerian study in the same location reported a lower level of knowledge of the HPV vaccination at 25%.[18] A similar study also carried out in north-central Nigeria revealed a similar result in which 15.4% of participants had heard about the HPV vaccines, 2.1% had received at least one dose of the vaccine, while only 0.4% had completed the 3 doses of the vaccine.[19]

In a related study carried out among female undergraduates in south-south Nigeria, 26% of respondents had heard about the HPV vaccines, while only 5.1% had been vaccinated against the HPV.[20] A similar result was also reported by another study in south-south Nigeria in which only 17% of female undergraduates had good knowledge of the HPV vaccine, while only 0.44% had received the vaccine.[21] In addition, a related study in south-west Nigeria reported that 53.3% of respondents had a fair knowledge of the HPV vaccines, while only 5.4% had completed 3 doses of the vaccine. The barriers to vaccination reported by the respondents were lack of awareness, vaccine cost and safety.[22]

Female undergraduates in Nigeria make up part of the female adolescent and youth population in the country. Considering that routine HPV vaccination in Nigeria commenced in October 2023, most female undergraduates in Nigeria may not have been vaccinated at the time of this study.[23] For female undergraduates in Nigeria to uptake the HPV vaccination adequately, they need good knowledge of the vaccines, and a positive attitude towards the vaccines.

The persistent low knowledge of the HPV vaccines, and poor attitude towards the HPV vaccines among female undergraduates in Nigeria will adversely affect the uptake of the vaccine. The low uptake of the HPV vaccine among female undergraduates in Nigeria will hinder the efforts to control the prevalence of the HPV infection and cervical cancer in the country, especially among a population with a higher probability of exposure to the HPV.

This study assessed the knowledge, perception, and uptake of the HPV vaccine among female undergraduates in Babcock University, Ogun State, Nigeria. The study will add to the relevant literature, while the findings will contribute to recommendations that will improve the uptake of the HPV vaccination among female undergraduates in Nigerian universities.

Materials and Methods

Study Location

This study was done in Babcock University located in Ilishan-Remo, Ogun State, Nigeria. Babcock University is a private university owned and operated by the Seventh-Day Adventist Church. The university has 13 schools (Basic Medical Sciences, Basic Clinical Sciences, Clinical Sciences, Computing, Education and Humanities, Engineering, Environmental Sciences, Law and Security Studies, Management Sciences, Nursing Sciences, Public and Allied Health, Science and Technology, and Social Sciences), and two colleges (College of Health and Medical Sciences, and College of Postgraduate Studies).

Study Design

It was a descriptive cross-sectional study.

Study Population

Female students who reside in the halls within the University were included in the study, while female students who were absent during data collection (January to February 2025) were excluded from the study.

Sample Size Determination

The sample size was calculated using Cochrane's formula, $n = z^2pq/d^2$; where: n = minimum sample

size, z = standard normal deviate set at 1.96, which conforms to a 95% confidence level; p = estimated proportion of a related variable or characteristic from a related study; q = 1 - p; d = error margin, which was set at 0.05 (5%).
A study carried out among female undergraduates in the University of Lagos, Nigeria reported that 21.1% of the participants had a good knowledge of the HPV vaccination.[24]

Therefore:
$p = 21.1\% = 0.211$
$q = 1 - 0.211 = 0.789$.
$n = (1.96)^2 \times (0.211)(0.789) \div (0.05)^2$
$n = 0.6395 \div 0.0025$
$n = 256$.
Accounting for a 10% non-response rate (0.1);
Adjusted sample size = Initial sample size ÷ (1 - non-response rate)
Adjusted sample size = 256 ÷ (1 - 0.1)
Sample size = 256 ÷ 0.9
Sample size= 285.
This sample size was increased to 300 for greater accuracy and representation of the study population.

Sampling Technique
The multi-stage sampling technique was used to select the study participants thus:
In the first stage, simple random sampling by balloting was used to select 10 out of the 11 female halls in the institution.
In the second stage, 12 rooms were selected from each of the 10 halls using simple random sampling by balloting, making a total of 120 rooms. Of the 120 rooms selected, 70 rooms were occupied by 6 students, 40 rooms were occupied by 4 students, while 10 rooms were occupied by one student.
In the third stage, simple random sampling by balloting was used to select 3 participants from the rooms occupied by 6 students (70 rooms and 210 participants selected), and 2 participants from the rooms occupied by 4 students (40 rooms and 80 participants selected); while there was an automatic selection of students occupying their rooms alone (10 rooms and 10 participants selected). This was done until the sample size was attained.

Study Instrument
The study instrument was a purpose-developed, self-administered, semi-structured, pretested questionnaire which had 5 sections. Section A contained the participants' socio-demographic characteristics, section B assessed the participants' knowledge of the HPV vaccines, section C assessed the participants' perception of the HPV vaccines, section D assessed the participants' uptake of the HPV vaccines, section E contained participants' reasons for non-uptake of the HPV vaccine (barriers to the uptake of the vaccine).

Measurement of Outcome Variables
The outcome variables (knowledge, perception, and uptake of the HPV vaccines) were measured thus:
1. For their knowledge, one mark was given for each correct answer to the questions used to assess their knowledge and the sum of the marks for each participant was determined. Then, 5 (half of the total score of 10) was used as the cut-off to determine good knowledge (≥5) and poor knowledge (<5).
2. The 5-point Likert scale was used to score their answers to the questions assessing their perception of the HPV vaccines. The answers to the positive questions were scored thus: strongly agree = 5 points, agree = 4 points, neutral = 3 points, disagree = 2 points, strongly disagree = 1 point.

The answers to the negative questions were scored in the reverse direction.
The sum of points (score) for each participant was determined. Then, 25 (half of the total score of 50) was used as the cut-off for good perception (≥25) and poor perception (<25).
3. A dichotomous scale (Yes/No) was used to assess the uptake of the HPV vaccine among participants with a "yes" for those who had received at least one dose of the vaccine, and a "no" for those who had not received any dose of the vaccine. The number of doses received was also recorded.

Data Analysis
The gathered data were analysed using the IBM Statistical Package for the Social Sciences (SPSS) version 25. Univariate analysis (tables and percentages) was used to summarise the participants' sociodemographic characteristics, knowledge of the HPV vaccination, perception of

the HPV vaccination, uptake of the HPV vaccination, and barriers to vaccination. Then, the factors associated with the knowledge, perception and uptake of the HPV vaccination were identified using bivariate analysis (Pearson Chi-Square test). The confidence level was 95%, while statistical significance was set at $p < 0.05$.

Ethical Approval

Ethical approval for this study was obtained from the Babcock University Health Research and Ethics Committee (BUHREC 663/24). Participation was voluntary, and participants were given complete information about the study's objectives and process. A well-informed consent was obtained before participation in the study. Strict adherence to the established ethical guidelines and protocols was maintained throughout the research process. Participants were also at liberty to opt out of the study at any point without any consequence.

Limitation

Some of the answers to the questions in the self-administered questionnaire may have been dishonest. This was mitigated as much as possible by encouraging the participants to be fully honest in their responses, and assuring them of strict anonymity and confidentiality after explaining the importance of the study to them.

Table 1: Sociodemographic Characteristics of Participants

Variable	Frequency N = 300	Percent (%)
Age in years (Mean = 19.5 ± 1.5)		
16-18	81	27.0
19-22	206	68.7
23 & above	13	4.3
Ethnic Group		
Yoruba	137	45.7
Igbo	152	50.7
Hausa	11	3.7
Marital Status		
Married	28	9.3
Single	270	90.0
Divorced	2	0.7
Academic Level		
100	11	3.7
200	52	17.3
300	77	25.7
400	125	41.7
500	31	10.3
600	4	1.3
Religion		
Christianity	257	85.7
Islam	39	13.0
Traditional	4	1.3

Result

Table 1 shows that majority of the respondents, were within the 19 – 22 years age group, single and were Christians. Slightly above half of the respondents were Igbos, while slightly above two-fifths were in their 400 level of study.

Table 2 shows that majority of the participants had heard about cervical cancer and the HPV vaccination; more than three-fifths and slightly above half correctly identified the route of administration and the recommended time for vaccination respectively. However, less than half of the respondents correctly identified the recommended number of doses of vaccination.

Table 2: Respondents' Knowledge of the HPV Vaccination

Variable	Response	Frequency (N=300)	Percent (%)
Ever heard of cervical cancer	Yes	239	79.7
	No	61	20.3
Ever heard of the HPV vaccination	Yes	216	72.0
	No	84	28.0
The HPV vaccine protects against certain types of the Human Papilloma Virus	Yes	197	65.7
	No	22	7.3
	I don't know	81	27.0
Routes of administration of the vaccine	Orally	12	4.0
	Injection	189	63.0
	Skin patches	27	9.0
	Tablets	62	20.7
	I don't know	10	3.3
Recommended doses for the vaccination	1	15	5.0
	2-3	139	46.3
	More than 3	60	20.0
	I don't know	86	28.7
Recommended time for vaccination.	Before first sexual intercourse	153	51.0
	After first sexual intercourse	21	7.0
	If you have more than one sexual partner	53	17.7
	I don't know	73	24.3
Who should be vaccinated against HPV	Males	10	3.3
	Females	136	45.3
	Both	154	51.3
HPV vaccine protects against all Sexually Transmitted Infections (STIs)	Yes	44	14.7
	No	205	68.3
	I don't know	51	17.0
Some HPV vaccines also protect against genital warts	Yes	49	16.3
	No	83	27.7
	I don't know	168	56.0
The HPV vaccine offers 100% protection against cervical cancer.	Yes	156	52.0
	No	111	37.0
	I don't know	33	11.0

Table 3 shows that more than half of the respondents agreed that the HPV vaccine should also be administered to boys; less than half agreed that it was too expensive, while majority agreed that the vaccine was effective in preventing cervical cancer, and that all young females should be vaccinated.

However, more than one-tenth of respondents agreed that the vaccine is a means to monitor people, while less than one-tenth agreed that the vaccine causes infertility.

Table 4 shows that less than one-fifth of the respondents had been vaccinated against the HPV, and out of those vaccinated, a little above one-tenth had completed 3 doses of the HPV vaccine. Overall, only one out of 50 participants had completed 3 doses of the HPV vaccine. Out of the participants that had not been vaccinated, four-fifths were willing to get vaccinated.

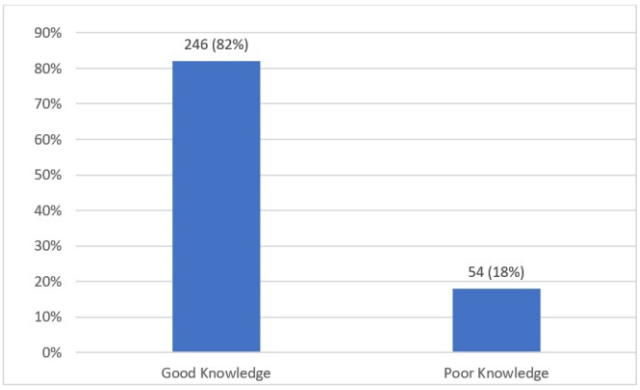

Figure 1: Category of Respondents' Knowledge of the HPV Vaccination

Figure 1 shows that majority of the respondents (82%) had good knowledge of the HPV vaccination.

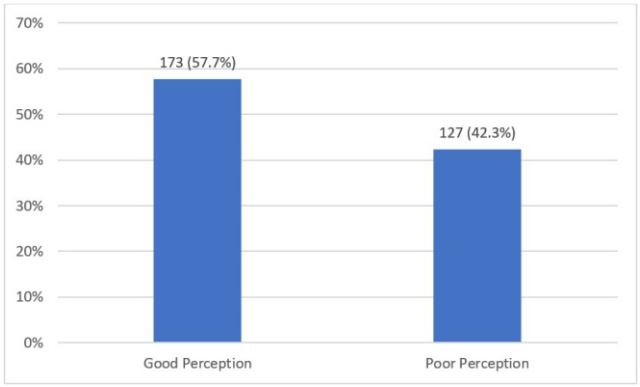

Figure 2: Category of Respondents' Perception of the HPV Vaccination

Figure 2 shows that more than half (57.7%) of the respondents had a good perception of the HPV vaccination.

Table 5 shows that more than half of the respondents identified not being sexually active as a reason why they had not been vaccinated yet. Also, more than a quarter of participants identified the non-availability of the vaccine at the health facility as a reason for the non-uptake of the vaccine, while almost a quarter identified the cost of the vaccine and safety concern as reasons for the non-uptake of the vaccine.

Table 6 shows that participants that were within the ages of 16 – 18 years, and were in 100 level, 500 level and 600 level had the highest percentage of good knowledge of the HPV vaccination. In addition, age and academic level had a statistically significant association ($p < 0.05$) with the knowledge of the HPV vaccination.

Table 7 shows that participants that were within the ages of 16 – 18 years, separated, and were in 100 level and 600 level had the highest percentage of good perception of the HPV vaccination. In addition, age, marital status and academic level had a statistically significant association ($p < 0.05$) with the perception of the HPV vaccination.

Table 8 shows that participants that were single, and were in 400 level had the highest percentage of uptake of the HPV

Table 3: Respondents' Perception of the HPV Vaccination

Variable	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)	Total n (%)
HPV vaccine should be taken by boys too	65 (21.7)	104 (34.7)	50 (16.7)	51 (17.0)	30 (10.0)	300 (100)
The HPV vaccine is very expensive	50 (16.7)	79 (26.3)	135 (45.0)	34 (11.3)	2 (0.7)	300 (100)
HPV vaccine shouldn't be taken by older women	39 (13.0)	37 (12.3)	91 (30.3)	92 (30.7)	41 (13.7)	300 (100)
HPV vaccine should be available in all hospitals	234 (78.0)	43 (14.3)	7 (2.3)	5 (1.7)	11 (3.7)	300 (100)
HPV vaccine is an effective means to prevent cervical cancer.	164 (54.7)	87 (29.0)	41 (13.7)	4 (1.3)	4 (1.3)	300 (100)
It is necessary for all young females to be vaccinated against cervical cancer.	183 (61.0)	77 (25.7)	22 (7.3)	18 (6.0)	0 (0.0)	300 (100)
Cervical cancer vaccination is used by the government to monitor and control people.	8 (2.7)	30 (10.0)	70 (23.3)	102 (34.0)	90 (30.0)	300 (100)
Cervical cancer vaccination causes infertility and reduces population.	6 (2.0)	8 (2.7)	99 (33.0)	89 (29.7)	98 (32.7)	300 (100)
HPV vaccine has long term serious side effects.	17 (5.7)	28 (9.3)	140 (46.7)	89 (29.7)	26 (8.7)	300 (100)
HPV vaccination should be taken before first sexual experience.	74 (24.7)	112 (37.3)	99 (33.0)	13 (4.3)	2 (0.7)	300 (100)

Table 4: Respondents' Uptake of the HPV Vaccination

Variable	Response	Frequency (N=300)	Percent (%)
Have you taken the HPV vaccine	Yes	53	17.7
	No	247	82.3
If yes, how many doses have you taken (n=53)	1	34	64.2
	2	13	24.5
	3	6	11.3
Overall, how many had completed 3 doses of the HPV vaccine (N=300)	Yes	6	2.0
	No	294	98.0
If you've not taken the vaccine, are you willing to get vaccinated (n=247)	Yes	199	80.6
	No	48	19.4

Table 5: Reasons for the Non-uptake of the HPV Vaccination

Variable	Frequency (n=247)	Percent (%)
I'm not sexually active	128	51.8
I don't think I need the vaccine	62	25.1
It's too expensive	60	24.3
I'm worried about its safety	55	22.3
I'm too old for it	21	8.5
My culture forbids vaccination	14	5.7
My religion forbids vaccination	12	4.9
My partner is against me getting vaccinated	14	5.7
I just don't want it	27	10.9
My parents are against it.	10	4.0
It will be used to monitor or control my activities	10	4.0
It will make me infertile and unable to have children	18	7.3
It was not available at the health facility	66	26.7

Table 6: Factors Associated with Respondents' Knowledge of the HPV Vaccination

	Knowledge					
Variable	Poor	Good	Total	χ^2	Df	p-value
Age				6.183	2	*0.045
16-18 years	10 (12.3)	71 (87.7)	81 (100.0)			
19-22 years	44 (21.4)	162 (78.9)	206 (100.0)			
23 years & above	0 (0.0)	13 (100.0)	13 (100.0)			
Academic Level				12.647	5	*0.027
100 level	0 (0.0)	11 (100.0)	11 (100.0)			
200 level	12 (23.1)	40 (76.9)	52 (100.0)			
300 level	14 (18.2)	63 (81.8)	77 (100.0)			
400 level	28 (22.4)	97 (77.6)	125 (100.0)			
500 level	0 (0.0)	31 (100.0)	31 (100.0)			
600 level	0 (0.0)	4 (100.0)	4 (100.0)			

* = Statistically significant

Table 7: Factors associated with Respondents' Perception of the HPV Vaccination

	Perception					
Variable	Poor	Good	Total	χ^2	Df	p-value
Age				6.278	2	*0.043
16-18 years	25 (30.9)	56 (69.1)	81 (100.0)			
19-22 years	95 (46.1)	111 (53.9)	206 (100.0)			
23 years & above	7 (53.8)	6 (46.2)	13 (100.0)			
Marital Status				11.639	2	*0.003
Married	4 (14.3)	24 (85.7)	28 (100.0)			
Single	123 (45.6)	147 (54.4)	270 (100.0)			
Separated	0 (0.0)	2 (100.0)	2 (100.0)			
Academic Level				37.944	5	*<0.001
100	0 (0.0)	11 (100.0)	11 (100.0)			
200	16 (30.8)	36 (69.2)	52 (100.0)			
300 level	43 (55.8)	34 (44.2)	77 (100.0)			
400 level	65 (52.0)	60 (48.0)	125 (100.0)			
500 level	3 (9.7)	28 (90.3)	31 (100.0)			
600 level	0 (0.0)	4 (100.0)	4 (100.0)			

* = Statistically significant.

Table 8: Factors Associated with Respondents' Uptake of the HPV Vaccination

	Uptake					
Variable	Yes	No	Total	χ^2	Df	p-value
Marital Status				7.152	2	*0.028
Married	0(0.0)	28(100.0)	28(100.0)			
Single	53(19.6)	217(80.4)	270(100.0)			
Separated	0(0.0)	2(100.0)	2(100.0)			
Academic Level				17.672	5	*0.003
100 level	0(0.0)	11(100.0)	11(100.0)			
200 level	10(19.2)	42(80.8)	52(100.0)			
300 level	10(13.0)	67(87.0)	77(100.0)			
400 level	33(26.4)	92(73.6)	125(100.0)			
500 level	0(0.0)	31(100.0)	31(100.0)			
600 level	0(0.0)	4(100.0)	4(100.0)			

* statistically significant.

vaccination. Marital status and academic level had a statistically significant association ($p < 0.05$) with the uptake of the HPV vaccination.

Discussion

This study aimed to determine the knowledge, perception, and uptake of the HPV vaccination, as well as the associated factors among female undergraduates of Babcock University, Ogun State, Nigeria.

A little above four-fifths of the respondents in this study had good knowledge of the HPV vaccination. Participants that were 23 years and above, as well as participants in 100 level, 500 level and 600 level of study had the highest level of knowledge of the HPV vaccination when compared to participants in other age categories and other levels of study respectively. This may have resulted from the fact that older participants may have been more exposed to messages about HPV vaccination; and health messages (including HPV vaccination) incorporated into the orientation programmes for new students, as well as the reiteration of the messages when they are in their final year of study. This may have also resulted from the messages and jingles about HPV vaccination on the mass media and social media after Nigeria included the HPV vaccines as part of her National Programme on Immunization (NPI) schedule.[23]

A good knowledge of the HPV vaccines is needed for the adequate uptake of the vaccines. This level of knowledge of the HPV vaccines among the study participants is commendable, although an improvement is desirable. The knowledge of HPV in this study was much higher than the knowledge of HPV vaccination reported by similar studies carried out in north-central Nigeria in which less than one-

third of the participants had adequate knowledge of the HPV vaccination.[17,18] This variation may have resulted due to the different locations in which the studies were carried out.

The level of knowledge of the HPV vaccines in this study, though higher, was somewhat similar to the levels of knowledge reported by similar studies carried out in Indonesia[10] and South Africa[14] in which more than two-thirds of the participants had good knowledge of the HPV vaccination. However, the level of knowledge of the HPV vaccination reported in this study was much higher than the levels of knowledge reported by a related study done in Morocco in which less than one-tenth of the participants had good knowledge of the HPV vaccination.[15] This disparity may have resulted from differences in the socio-demographic characteristics of the study participants, and the information about the HPV vaccines that they had been exposed to so far.

The perception of the HPV vaccination in this study was fair as more than half, but less than two-thirds of the participants in this study had a good perception of the HPV vaccination. Obviously, the good knowledge of the HPV vaccination did not necessarily translate into a commensurate good perception among the respondents. In addition, participants that were within 16 – 18 years, those that were separated, and participants that were in their 100 level and 600 level of study had better perception of the HPV vaccination when compared to other participants. This may have also been the case because of the health messages the students receive at the commencement and towards the end of their course of study. For the separated students, the high level of good perception may have resulted because they were only two. If the perception of the HPV vaccination among the study population is poor, despite the good knowledge, it may negatively affect the uptake of the HPV vaccination.

The perception of the HPV vaccination reported in this study was almost the same with the perception reported by a related study in Ethiopia,[12] but lower than the perception reported by a related study in Saudi Arabia in which more than two-thirds of the respondents had a good perception of the HPV vaccination.[25] The similarity may be because both studies were sub-Saharan African studies, while the difference may be because the comparison study was done in the middle east.

Less than one-fifth of the participants in this study had been vaccinated against HPV (had received at least one dose of the vaccine), while only one out of 50 respondents had completed the three doses of the HPV vaccination. Among the respondents that were not vaccinated, four-fifths were willing to receive the HPV vaccine. This finding shows that despite the good knowledge and fairly good perception of the HPV vaccination among the respondents, the uptake of the vaccine was low.

Vaccine uptake is regarded as the endpoint and desired outcome of vaccination, especially with regards to clients. Hence, this low uptake of the HPV vaccine among the participants is a cause for concern. The low uptake of the HPV vaccination may result in a low herd immunity against HPV among the study group, and even the general populace, thereby increasing the susceptibility to HPV infection and its complications, especially cervical cancer.

The HPV vaccination uptake in this study was similar to the uptake reported by a related study in north-central Nigeria;[17] however, the comparison study had a higher completion percentage.[17] On the other hand, this study's HPV vaccination uptake and completion were higher than the uptake and completion reported by another study in north-central Nigeria.[19] Variations in the geopolitical zones of Nigeria, as well as the time difference between the two studies may have accounted for these dynamics.

The HPV vaccination uptake in this study was also similar to the HPV vaccine uptake reported by related studies done in Ghana,[16] South Africa[13] and China.9 However, the HPV vaccination uptake and completion in this study were lower than the vaccine uptake and completion reported by another study in the United States.[11] These may have resulted from similarities or differences (as the case may be) in the socioeconomic factors, vaccine availability and cost, as well as the willingness to get vaccinated among the participants in the various studies.

Some of the reasons or "barriers" stated for the non-uptake of the HPV vaccination among the respondents in this study included the non-availability of the vaccines at the health facilities, the cost of the vaccines, safety concern and even misconceptions such as the vaccine being a

monitoring or control chip and causing infertility. These barriers were similar to those reported by the participants in other related studies done within and outside Nigeria.[9,10,13,16,22]

In terms of the associated factors, age and level of study were significantly associated with the knowledge of HPV vaccination; age, marital status and level of study were significantly associated with the perception of HPV vaccination; while marital status and level of study were significantly associated with the uptake of HPV vaccination. These findings were similar to the findings from related studies done in Nigeria,[17,20] Ethiopia[12] and South Africa.[14]

Conclusion

The study participants demonstrated good knowledge and a fairly good perception of the HPV vaccination. However, there was poor uptake of the HPV vaccination. Barriers to HPV vaccine uptake included vaccine availability, vaccine cost, safety concern and misconceptions such as the vaccine causing infertility and being a monitoring or a control chip. There is a need to improve the knowledge, perception and uptake of the HPV vaccines among female undergraduates of Babcock University.

Recommendations

The school management should ensure that health education sessions on HPV vaccination are sustained. These sessions should also include messages that will address the barriers to the HPV vaccine uptake, and correct the misconceptions about the HPV vaccines. The school management should also ensure that the HPV vaccines are always available at the school's health facilities.

The Ogun State government and the local governments in the state should ensure that the HPV vaccines are always available at the state hospitals and primary health care centres so that students living outside the university campus and other clients needing the vaccines can obtain them wherever they are. In addition, the federal government should ensure that the HPV vaccines are administered free of charge to clients (just like other vaccines on the NPI schedule), or reasonably subsidized to an amount that is easily affordable.

Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contribution

ONE, NCC, AOJ, OCV, OKV and OOA participated in the study conceptualization, literature review, methodology, data collection, data analysis and writing the project; ONE wrote the initial draft of the manuscript, all authors reviewed the initial manuscript and approved the final version of the revised manuscript.

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