

Awareness, knowledge and uptake of human papillomavirus vaccine among female undergraduates in a University in Southwestern, Nigeria

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ABSTRACT

Background: Human papillomavirus (HPV) is the most prevalent sexually transmitted infection globally. HPV-associated cervical cancer is the second most common cancer among women in Nigeria. The HPV vaccine has been demonstrated to be highly effective against the HPV types implicated in 70% of cervical cancer cases. The HPV vaccine was approved in Nigeria in 2009. However, there have been reports of low vaccine uptake especially in young people.

Aim: This study sought to investigate the level of information regarding HPV infection, HPV vaccine and possible reasons for vaccine hesitancy among female undergraduate students in a University in Southwest, Nigeria.

Methods: This was a cross-sectional, descriptive study of 242 female undergraduate students of Babcock University, Nigeria. Self-administered questionnaires were used to obtain participants' socio-demographic characteristics, assess their knowledge of HPV infection and HPV vaccine, self-reported HPV vaccination status, and possible reasons for vaccine hesitancy.

Results: The majority, 68.2% and 64% of the participants had heard about HPV infection and HPV vaccine respectively. However, less than half of the participants knew the diseases associated with HPV, the occurrence of asymptomatic infection and the unavailability of a cure. Only 12.7% (n=29) reported that the vaccines are effective. Only 3.7% (n=9) of the participants had received HPV vaccine. No reason (41.8%), inadequate information about the vaccine (23.9%), and complications due to vaccination (16.4%) were some of the reasons for vaccine hesitancy.

Conclusion: There was a low level of knowledge of HPV infection and HPV vaccine. Hence, educational intervention is crucial to improve the knowledge and attitude towards the HPV vaccine.

Keywords: Human papillomavirus, HPV knowledge, HPV vaccine, HPV prevention, Vaccine hesitancy, University students.

INTRODUCTION

Human papillomavirus (HPV) is the most common sexually transmitted organism in humans with about 75% of sexually active men and women acquiring the infection at some point in their lives.¹⁻³ It is easily transmitted by skin-to-skin or skin-to-mucosa contact through oral, vaginal and anal sex and it can be transmitted by asymptomatic individuals.^{4,5} The global prevalence of HPV is about 11-12% with considerable regional variation; the highest prevalence is seen in sub-Saharan Africa (24%), Eastern Europe (21%) and Latin America (16%).⁶⁻⁸ Over 200 HPV genotypes have been described and they have subsequently been classified into high-risk or low-risk based on their oncogenic potential. High-risk HPV has been attributed to 4.8% of the cancer burden worldwide.^{4,6,9} High-risk HPV genotypes have been implicated in 99.7% of cervical cancers.⁹ Infections caused by the low-risk HPV genotypes rarely cause cancer. The most prevalent HPV genotypes worldwide are high-risk genotypes 16 (3.2%), and 18 (1.4%).^{8,10} HPV 16 and 18 contribute to 70% of cervical cancers.^{11,12} Cervical cancer is the fourth most common cancer globally and is estimated that a woman dies from cervical cancer every 2 minutes.¹³ It disproportionately affects women in low- and middle-income countries (LMICs) as the majority of the cases and deaths occur in these countries.¹³ In Nigeria and Africa in general, cervical cancer is the second most common cancer among women.¹⁴ In Nigeria, the estimated annual incidence and the annual death toll are 12,075 and 7,968 respectively.¹⁵ It is also estimated that about 3.5% of women in the general population have HPV-16/18 cervical infection at a given time.¹⁵ HPV is usually acquired shortly after sexual debut.^{16,17} Over 20% of women have HPV infection within 3 years of coitarche (first

sexual intercourse) in Nigeria.¹⁸ The range of median age at coitarche in females is 16.7-17.9 years and about 15.6% of 15-year-old girls have had sexual intercourse.¹⁵ Hence, human papillomavirus infection is most prevalent in the young population with the highest rate between the ages of 18 and 30 years.¹⁸ Furthermore, the period of adolescence and youth is associated with risky behaviours and exploratory sexual practices which further increase the risk of HPV infection and could threaten long-term health and well-being.^{16,17} Hence, there is a need to put in place an active prevention program.

Primary prevention of HPV infection and thus cervical cancer through vaccination has been proven as the most effective means of prevention. HPV vaccine was first introduced in 2006 and was available for use in females between the ages of 9-26 years (preferably before sexual debut). This vaccine has been introduced to the childhood immunization program in many countries for girls aged between 9 and 13 years. HPV vaccine was introduced in Nigeria in 2009. However, over a decade later, studies have reported low vaccine coverage since its introduction with factors such as low level of awareness, prohibitive costs and limited availability of the vaccine as major barriers to its uptake.²⁰⁻²⁵ In October 2023, the HPV vaccine was integrated into the Expanded Programme on Immunization (EPI) in Nigeria, aimed at vaccinating 7.7 million girls aged 9-14. Hence, female adolescents within this age group, are eligible to receive single-dose HPV vaccine at no cost.²⁶

Several studies have reported poor awareness and knowledge of HPV infection and HPV vaccine in Nigeria.^{24,27-31} Furthermore, there have been reports of vaccine hesitancy due to widespread misinformation.^{32,33} Hence, the need to access the level of information on HPV

infection and HPV vaccine, the willingness for vaccination in unvaccinated participants and possible reasons for vaccine hesitancy.

The study aimed to investigate the level of information regarding HPV infection and HPV vaccine among female University students, the self-reported vaccination rate, vaccine intention in unvaccinated participants and possible reasons for vaccine hesitancy.

MATERIAL AND METHODS

Study Design and Setting

This was a descriptive, cross-sectional study among female undergraduate students of Babcock University, a private University owned by the Seventh-Day Adventist Church. The University is located in Ilishan-Remo, Ogun State, Nigeria and has a student population of about 10,000. The study was conducted over a 6-month, from September 2022 to February 2023.

Study Population

The study was conducted among female undergraduate students between the ages of 16 - 26 years.

3.4 Sample Size Determination and Sampling Method

The sample size was determined using the Fisher formula:

To minimize errors due to non-compliance, 10% was added to the sample size resulting in a final sample size of approximately 213. The study participants were selected by convenience sampling

Inclusion criteria

- Female undergraduate students of Babcock University
- Within the age range of 16 - 26 years of age
- Persons who were willing to fill out the questionnaire

Exclusion criteria

- Female students outside the age range of 16 - 26 years
- Male students

- Female students who were unwilling to fill out the questionnaire

Ethical consideration

Ethical clearance was obtained from the Babcock University Health Research and Ethics Committee before the commencement of the study (BUHREC692/22). Participation was voluntary, written informed consent was sought and consenting female undergraduate students within the age range were recruited into the study. Anonymity was ensured by not obtaining personal information such as names and addresses from participants. Participants' confidentiality was maintained and data collected were saved in a password-protected laptop only accessible by the research team.

Data collection

Pre-tested, self-administered, questionnaires were filled by participants. The questionnaire consisted of three parts. Part 1 explored the socio-demographic characteristics and sexual history of participants. The demographics included the age, school/faculty, year of study and marital status. The sexual history addressed history of sexual intercourse, age at initiation of sexual intercourse, number of lifetime partners, condom use, and history of sexually transmitted infection.

Part 2 consisted of questions regarding HPV infection such as knowledge of the virus, disease caused by the virus, persons at risk of the infection, mode of transmission, presence of cure and effective means of prevention. Part 3 assessed participants' knowledge of the HPV vaccine, who should be vaccinated, the effectiveness of the vaccine, the best age for vaccination, self-reported vaccination status, willingness to receive the HPV vaccine and possible reasons for vaccine hesitancy.

Data analysis

Data collected was analysed using IBM_SPSS Statistics for Windows version 22. Standard descriptive statistics were used to summarise the data.

RESULTS

Socio-demographic and behavioural characteristics

A total of 242 female undergraduate students participated in the study. The mean age of the participants was 19.1 years (SD = 1.3, range 16 – 25). As shown in Table I, the majority (36.4%) of the participants were in the School of Health and Medical Sciences and the majority were in their 3rd and 4th years of study, 34.3% and 32.6% respectively. All the participants were unmarried. About 85.4% of the participants reported never to have had sexual intercourse. The mean age of first sexual intercourse was 18.2 years (SD = 1.6, range 15 – 21). The number of lifetime sexual partners ranged from 1 - 7 with about 48.5% of them having more than one lifetime sexual partner. Only 34.3% reported using a condom during every incidence of sexual intercourse. One of the participants reported a previous history of syphilis. The majority (61.7%, n=132) had no concern about possible HPV infection while 38.3% (n=82) were concerned about possible HPV infection.

Knowledge of HPV

The majority 62.2% of the participants had heard of HPV. As shown in Table II, the most common sources of information about HPV infection among the participants included school (40.5%), social media (30.2%) and seminars (29.3%). About 41% of the participants recognized HPV as the aetiologic agent of genital warts and 38% as the aetiological agent of cervical cancer. Most (83.9%) of the participants correctly identified that HPV is different from HIV. The majority (52.1%) of the participants reported that both males and females are at risk of HPV infection.

Most of the participants identified unprotected vaginal sex (75.6%), anal sex (82.2%), and oral sex (42.1%) as modes of transmission of HPV. About 34.3% of the participants reported that HPV is common in society and 41.7% reported that symptoms of HPV infection are not always obvious. Only 27.3% of participants reported that there is no cure for HPV infection while 56.2%, 47.9%, and 46.7% reported that abstinence, vaccination and use of condoms are the most effective means of prevention of HPV infection.

Knowledge of HPV vaccine

Of the 242 participants, 64% were aware of the HPV vaccine. School (40.1%), hospital/health workers (24.0%) and the internet (22.7%) were the three most common sources of information about the HPV vaccine. Table III shows that only 3.7% of the participants had received the HPV vaccine while 96.3% were yet to be vaccinated. About 34% reported that both males and females could be vaccinated against HPV and only 12.7% of the participants reported that the HPV vaccine is effective. The majority (60.4%) were willing to receive the HPV vaccine while 20% were unwilling to receive the vaccine. Reasons for vaccine hesitancy included inadequate information about the vaccine (23.9%), complications due to the vaccine (16.4%), need for parental consent (11.9%) and high cost of vaccine (6.0%). Table 4 shows the awareness of the respondents and the rate of HPV vaccine uptake.

DISCUSSION

The study aimed to assess the level of knowledge of HPV infection and uptake of HPV vaccine among female undergraduate students at Babcock University. In this study, we observed sub-optimal knowledge of HPV infection and HPV vaccines as well as very low vaccine uptake among the students and high levels of willingness to receive the vaccine.

The proportion of participants with awareness of HPV infection and HPV vaccine (68.2% and 64% respectively) is similar to the level of awareness observed in a study among new intake nursing students in Benin City, Nigeria which reported 68.5% and 63% respectively.³² The level of awareness of HPV was higher than that of a similar study conducted earlier in the same University among female undergraduate students which reported an awareness of 54.5%.²⁸ It is also higher than reports of other studies about the awareness of HPV infection and HPV vaccine among undergraduate students in Niger (34.8% and 25.0% respectively)³¹, Kebbi (29.0% and 29.2% respectively)²⁹, Edo (5.2% and 17.0% respectively)²⁴, and Lagos (17.7% and 14.4% respectively)²⁷. However, it is lower than that reported in a study among medical and allied health students in Northern Nigeria (80%), and medical students in Lagos, Nigeria (85.4% and 69.3% respectively) which reported the level of awareness as 80%.³⁴

Overall, there was a low level of knowledge of HPV infection as less than half of the participants were aware of HPV being implicated in genital warts, cervical and vaginal cancers, less than one-third were aware of HPV being implicated in vulvar, penile and head and neck cancers as well as laryngeal warts. In addition, less than half of the participants were aware of the possible asymptomatic nature of HPV infection and the unavailability of a cure. Although, more than half of the participants reported the role of abstinence from sexual intercourse as an effective means of prevention of HPV and about half of the participants reported the role of vaccination, use of condoms and avoiding multiple sexual partners in effectively preventing HPV infection. Furthermore, about 1 in 4 of the participants, reported a misconception

(washing of genitalia after sexual intercourse) as an effective means of prevention of HPV infection.

Some studies have also reported a low level of knowledge about HPV infection among undergraduate students.^{34,35,35,36,27,30,29,31,25}

The knowledge gaps observed in this study highlight the urgent need for early education on cervical cancer prevention and HPV vaccination at all levels of education in Nigeria. The source of information for over one-third of the participants was school. Thereby, further emphasizing the need for HPV education at all levels of the education system. The internet and social media also play a big role in the education on HPV infection and promotion of HPV vaccines as about one-quarter to one-third of participants obtain information via these channels.

A high proportion of participants had a positive attitude to the HPV vaccine and were willing to be vaccinated. This is similar to reports among students in Benin³⁶, Lagos^{27,37}. However, a low level of vaccine uptake (3.7%) was observed. The low vaccine uptake in this study is a reflection of the low level of knowledge of the HPV vaccine. Lack of awareness of the HPV vaccine negatively impacts the vaccine uptake. Low HPV vaccine uptake has also been reported in several studies in Nigeria such as Gombe (3.7%)³⁰, Lagos (2.6% and 5.3%)^{25,37}, Benin (0.9% and 3.7%)^{32,36}, Port Harcourt (5.1%)²¹, Ogun (14.2%)¹⁸. However, higher rates of HPV vaccine uptake have been reported in studies in Germany (67%)³⁸ and the United States of America (47.3%)³⁹.

Factors contributing to vaccine hesitancy among the participants include inadequate information about the vaccine, concerns about possible complications of the vaccine, need for parental consent and high cost of the vaccine, over one-third of the participants gave no reason for vaccine

hesitancy. None of the participants highlighted religious reasons as a possible barrier to HPV vaccine uptake. This is similar to the report from a study in Lagos which highlighted similar reasons for low vaccine uptake among participants. However, some of the participants reported a lack of access to vaccines (40.8%) and religious reasons (17.7%) as barriers to vaccine uptake which was not observed in our study.³⁷ Adequate information about the HPV vaccines and their effectiveness is necessary to improve vaccine uptake while allaying fears and concerns about vaccine-related complications. There is also a need to extend the free vaccines to older individuals to ease the high cost of the vaccine while attaining a wider vaccine coverage and thereby reducing the prevalence of HPV infection and the incidence of cervical cancer.

Limitations of the study: The study may have been prone to information and recall biases. Furthermore, a more extensive quantitative study and qualitative interviews are desirable to elucidate the observations more substantively.

CONCLUSION

This study showed a low level of knowledge of HPV infection and HPV vaccine and a high level of willingness to receive the HPV vaccine but with an extremely low level of vaccine uptake. There is a need for an intense health promotion programme to raise awareness of HPV infection and educate on the existence of HPV vaccines at all levels of education in the country to combat the scourge of HPV infection and by extension cervical cancer.

Conflict of interest: The authors declare no conflict of interest

Authors' Contribution: All authors contributed to the conceptualization, design, data collection, data analysis/interpretation, preparation and approval of the manuscript for publication.

Running title: Awareness and uptake of HPV vaccine

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Table I: Socio-demographic and behavioural characteristics of the participants

Variables	Frequency	Percentage (%)
Age range (Years)		
16 – 18	95	39.2
19 – 21	125	51.6
22 – 24	21	8.7
>24	1	0.4
School/Faculty		
Health and medical sciences	88	36.4
Social science	56	23.1
Public and allied health	5	2.1
Management science	10	4.1
Law and security studies	3	1.2
Education and humanities	34	14.0
Science and technology	22	9.1
Nursing science	11	4.5
Computing and engineering science	13	5.4
Year of study		
1 st	8	3.3
2 nd	54	22.3
3 rd	83	34.3
4 th	79	32.6
5 th	17	7.0
6 th	1	0.4
Residence		
On campus	227	93.8

Off campus	15	6.2
Marital status		
Single	242	100
Married	0	0
Separated	0	0
Divorced	0	0
Have you ever had sex?		
Yes	35	14.6
No	205	85.4
Total	240	100
Age at first sexual intercourse		
15-16	5	15.6%
17-18	13	40.6%
19-20	10	31.2
21-22	4	12.5%
Total	32	100
Number of lifetime sexual partners		
1	17	51.5
2	11	33.3
3	2	6.1
4	1	3.0
5	1	3.0
>5	1	3.0
Total	33	100
Use of condoms		

Always	12	34.3%
Sometimes	11	31.4%
Rarely	9	25.7%
Never	3	8.6%
Total		
Positive history of smoking	7	2.9
Positive history of alcohol ingestion	36	14.9
History of use of recreational drugs	8	3.3

Table II: Knowledge of HPV Infection

Variables	Frequency	Percentage (%)
Heard of HPV		
Yes	165	68.2
No	77	31.8
Source of information		
TV/Radio	28	11.6
Social media	73	30.2
Internet	61	25.2
School	98	40.5
Hospital/health worker	55	22.7
Seminar/public talk	71	29.3
Friends	39	16.1
Print media	39	16.1
Parents	35	14.5
Diseases caused by HPV		

Genital warts	99	40.9
Cervical cancer	92	38.0
Vaginal cancer	84	34.7
Penile cancer	27	11.1
Chlamydia	29	12.0
Diabetes mellitus	30	12.4
Vulva cancer	58	24.0
Head and neck cancer	7	2.9
Gonorrhoea	20	8.3
Laryngeal warts	8	3.3
Syphilis	16	6.6
Are HIV and HPV different		
Yes	203	83.9
No	11	4.5
No idea	28	11.6
Who is at risk of HPV infection?		
Females only	66	27.3
Males only	8	3.3
Both males and females	126	52.1
No idea	42	17.4
Mode of transmission of HPV		
Unprotected vaginal sex	183	75.6
Oral sex	102	42.1
Anal sex	199	82.2
Hand shake with infected person	4	1.6

Sharing of contaminated sharp objects	27	11.1
Blood transfusion	40	16.5
Sharing of toilets with infected person	19	7.8
Kissing an infected person	5	2.1
Mosquito bites	1	0.4
Is HPV infection common in the society?		
Yes	83	34.3
No	65	26.8
No idea	94	38.8
Are the symptoms of HPV infection always obvious?		
Yes	25	10.3
No	101	41.7
No idea	116	47.9
Is there a cure for HPV infection?		
Yes	46	19.0
No	66	27.3
No idea	130	53.7
What is the most effective means of prevention of HPV		
Oral contraceptive use	39	16.1
Use of condoms	113	46.7
Douching	22	9.1
Washing of genitals after sex	59	24.3
Abstinence	136	56.2

Avoid having multiple sexual partners	111	45.9
Regular pap smear	73	30.2
Regular blood test	37	15.3
Vaccination	116	47.9

Table III: Knowledge of HPV vaccine

Variables	Frequency	Percentage (%)
Heard of HPV vaccine		
Yes	155	64.0
No	87	35.9
Source of information		
TV/Radio	13	5.4
Social media	53	21.9
Internet	55	22.7
School	97	40.1
Hospital/health worker	58	24.0
Seminar/public talk	44	18.2
Friends	24	9.9
Print media	7	2.9
Parents	19	7.8
Who can be vaccinated against HPV		
Males only	3	1.3
Females only	72	30.4
Both males and females	80	33.8
No idea	82	35.6

Total	237	100
Is HPV vaccine effective		
Yes	29	12.7
No	68	29.7
No idea	132	57.6
Total	229	100
Best age for vaccination (years)		
9-13	45	18.6
14-20	41	16.9
21-30	30	12.4
Any age	37	15.3
No idea	89	36.8
History of HPV vaccination		
Yes	9	3.7
No	233	96.3
Willingness to receive HPV vaccine		
Yes	142	60.4
No	47	20.0
No idea	46	19.6
Total	235	100
Reasons for vaccine hesitancy		
Inadequate information about the vaccine	16	23.9
Parental consent needed	8	11.9
High cost of vaccine	4	6.0

Complications due to 11 vaccination	16.4
No reason 28	41.8
Total 67	100

