



Determinants of Human Papillomavirus Vaccine Uptake among Female Medical Students at Rivers State University, Nigeria

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ARTICLE'S INFO

Article No.: 020526024

Type: Research

Full Text: [PDF](#), [PHP](#), [HTML](#), [EPUB](#), [MP3](#)

DOI: [10.15580/gjeph.2026.1.020526024](https://doi.org/10.15580/gjeph.2026.1.020526024)

Accepted: 10/02/2026

Published: 23/02/2026

Keywords: Human papillomavirus; HPV vaccination; Vaccine uptake; Determinants; Medical students; Nigeria; Cervical cancer prevention

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Article's QR code



ABSTRACT

Background: Human papillomavirus (HPV) is the leading cause of cervical cancer, a major public health burden in Nigeria. Despite the availability of effective prophylactic vaccines, uptake remains critically low, even among high-risk and informed groups such as medical students.

Objective: This study aimed to determine the prevalence and identify the key determinants of HPV vaccine uptake among female medical students at Rivers State University.

Methods: A descriptive cross-sectional study was conducted among 214 female students from the College of Medical Sciences, selected via multistage random sampling. Data were collected using a structured, self-administered questionnaire. Variables included socio-demographics, sexual history, knowledge of HPV and the vaccine, and vaccination status. Data analysis was performed using SPSS version 27, employing descriptive statistics, chi-square tests, and logistic regression.

Results: The mean age of respondents was 20.8 ± 2.8 years. Only 21.0% (n=45) had received at least one dose of the HPV vaccine, and 11.2% (n=24) were fully vaccinated. Uptake was significantly higher among students aged 21–25 years (34.4% vs. 9.8%, $p < 0.001$), those in higher academic levels (69.2% in 600-level vs. 0% in 100-level, $p < 0.001$), those who were sexually active (36.2% vs. 13.8%, $p < 0.001$), and those with good knowledge of the HPV vaccine (37.8% vs. 0%, $p < 0.001$). Willingness to pay for the vaccine was also a significant predictor (25.7% vs. 11.4%, $p = 0.016$). Major barriers included lack of awareness (22%), high cost (45%), and not knowing where to access the vaccine (30%).

Conclusion: HPV vaccine uptake among female medical students remains unacceptably low, driven by knowledge gaps, financial barriers, and poor access. Targeted interventions, including institutional vaccination programs, subsidized costs, and comprehensive education campaigns, are urgently needed to improve coverage in this key demographic.

1. INTRODUCTION

Cervical cancer constitutes a significant global health challenge, with an estimated 604,000 new cases and 342,000 deaths in 2020 alone [1]. In Nigeria, it is the third most common cancer among women and the second leading cause of cancer-related mortality in women aged 15–44 years, presenting a critical public health burden [2]. Virtually all cervical cancer cases are attributable to persistent infection with high-risk strains of the human papillomavirus (HPV), particularly types 16 and 18 [3].

The development of prophylactic HPV vaccines represents a landmark achievement in preventive oncology. Vaccines such as the bivalent (Cervarix®), quadrivalent (Gardasil®), and nonavalent (Gardasil 9®) formulations have demonstrated high efficacy in preventing infection from the most oncogenic HPV types and subsequent precancerous lesions [4]. The World Health Organization (WHO) recommends vaccination for girls aged 9–14 years, ideally before sexual debut, and has endorsed a single-dose schedule as a viable strategy to improve coverage [5]. This forms a cornerstone of the WHO's Global Strategy to Eliminate Cervical Cancer, which targets 90% HPV vaccination coverage among girls by 2030 [5].

Despite this clear preventive pathway, HPV vaccine uptake remains inadequate worldwide, especially in low- and middle-income countries (LMICs) like Nigeria. Globally, only about 31% of girls have received at least one dose, and a mere 21% have completed the full series [6]. In Nigeria, studies consistently report alarmingly low uptake, with rates ranging from 2.6% to 5.1% among young women and female undergraduates [7,8]. Systemic barriers, including high vaccine cost, limited availability, pervasive misinformation, and weak immunization infrastructure, perpetuate this coverage gap [9].

Medical students represent a unique and crucial demographic. As future healthcare providers, they can significantly influence community norms and patient recommendations through their personal health behaviours and professional attitudes. They are also within the catch-up vaccination age range (15–26 years). However, evidence suggests a persistent knowledge-practice gap even within this group, in which high general awareness of HPV does not translate into personal vaccination [10,11]. In Nigeria, studies among health science students have reported uptake rates as low as 3.7% to 14.0% [12,13].

There is a paucity of recent, context-specific data on HPV vaccine uptake and its determinants among medical students in southern Nigeria. This study, therefore, aimed to assess the pattern, prevalence, and key determinants of HPV vaccine uptake among female medical students at Rivers State University. The findings are intended to inform targeted interventions at the institutional and policy levels to improve vaccine acceptance and contribute to national cervical cancer prevention goals.

2. METHODS

2.1. Study Design and Setting

A descriptive cross-sectional study was conducted between July and September 2025 at the College of Medical Sciences, Rivers State University (RSU), Port Harcourt, Nigeria. RSU is a state-owned university located in the capital of Rivers State, a metropolitan area in Nigeria's South-South geopolitical zone.

2.2. Study Population

The study population comprised full-time female undergraduate students from five departments within the College of Medical Sciences: Medicine and Surgery, Nursing, Radiology, Physiotherapy, and Public Health. Students at levels 100 to 600 who had been enrolled for at least six months were eligible. Male students and those on long-term leave or exchange programs were excluded.

2.3. Sample Size and Sampling Technique

The minimum sample size was calculated as 206 using the Cochran formula for cross-sectional studies, with a 95% confidence level, a 5% margin of error, and an estimated prevalence (p) of 14.0% from a previous study [13]. A multistage sampling technique was employed:

- **Stage 1:** Stratification by department.
- **Stage 2:** Proportional allocation of the sample size to each department based on student population.
- **Stage 3:** Simple random sampling of eligible students from each stratum using student rosters.

2.4. Data Collection Instrument and Procedure

Data were collected using a structured, self-administered questionnaire developed from literature review and pretested. The instrument comprised four sections:

- **Section A:** Socio-demographic characteristics and sexual history.
- **Section B:** Knowledge of HPV infection and transmission.

- **Section C:** Knowledge and awareness of the HPV vaccine.
- **Section D:** HPV vaccination status, patterns, and attitudes.

Questionnaires were distributed electronically via Google Forms and in hard copy. Informed consent was obtained from all participants before data collection.

2.5. Measurement of Variables

- **Primary Outcome:** HPV vaccine uptake was a dichotomous variable (Yes/No) defined as self-reported receipt of at least one dose of any HPV vaccine.
- **Full Vaccination:** Completion of the recommended series: ≥ 2 doses if the first dose was before age 15, or ≥ 3 doses if the first dose was at age 15 or older.
- **Knowledge Scores:** Knowledge of HPV and the HPV vaccine was assessed using multiple-choice questions. Correct answers were summed, and total scores were categorized as Good ($\geq 75\%$), Fair (50–74%), or Poor ($< 50\%$).
- **Determinants:** Independent variables included age, department, level of study, ethnicity, religion, sexual activity, knowledge scores, and willingness to pay for the vaccine.

2.6. Data Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 27.0. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. Associations between vaccine uptake and independent variables were examined using the Chi-square test (or Fisher's exact test where appropriate). Binary logistic regression was performed to identify independent predictors of vaccine uptake, with results expressed as adjusted odds ratios (aOR) and 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$.

2.7. Ethical Considerations

Ethical approval was obtained from the Rivers State University Teaching Hospital Research Ethics Committee (Ref: RSUTH/REC/2025/06/123). Permission was granted by the College administration. Participation was voluntary, anonymous, and based on written informed consent. All data were kept confidential.

3. RESULTS

3.1. Socio-demographic Characteristics of Respondents

A total of 214 female students participated, yielding a response rate of 95%. The mean age was 20.8 ± 2.8

years, with the majority (52.3%) aged 16–20 years. Most respondents were from the Department of Medicine and Surgery (60.7%) and were in their fourth year of study (36.4%). Christianity was the predominant religion (98.6%), and 67.8% reported never having had sexual intercourse. (Table 1).

Table 1: Socio-demographic Characteristics of Participants (N=214)

Characteristic	Category	Frequency (n)	Percent age (%)
Age Group (Years)	16 – 20	112	52.3
	21 – 25	93	43.5
	26 – 30	6	2.8
	31 – 35	3	1.4
Department	Medicine & Surgery	130	60.7
	Nursing	54	25.2
	Physiotherapy	12	5.6
	Public Health	10	4.7
Level of Study	Radiology	8	3.7
	100	21	9.8
	200	18	8.4
	300	19	8.9
Ever had sex	400	78	36.4
	500	52	24.3
	600	26	12.1
	Yes	69	32.2
	No	145	67.8

3.2. Prevalence and Pattern of HPV Vaccination

Only 45 students (21.0%) reported having received at least one dose of the HPV vaccine. Of these, 24 (53.3% of vaccinated, 11.2% of total) were fully vaccinated. Among the vaccinated, 45.7% had received three doses, and 84.4% received their first dose during the catch-up age of 15–26 years. The most common vaccination site was a school-based program or university clinic (44.4%) (Table 2).

Table 2: Pattern of HPV Vaccination among Participants (n=45 vaccinated)

Variable	Category	Frequency (n)	Percent age (%)
Number of Doses Received	One dose	14	31.1
	Two doses	9	20.0
	Three doses	21	45.7
	Four doses	1	2.2
Age at First Dose	9 – 14 years (Recommended)	6	13.3
	15 – 26 years (Catch-up)	38	84.4
	≥27 years	1	2.2
Place of Vaccination	School/University Clinic	20	44.4
	Primary Health Care Centre	12	26.7
	General Hospital	5	11.1
	Health Outreach Campaign	4	8.9
	Tertiary Hospital	3	6.7
	Private Hospital	1	2.2

3.3. Knowledge of HPV and HPV Vaccine

General awareness of HPV was high: 92.1% had heard of HPV, and 95.8% correctly identified it as a viral infection. However, knowledge about the vaccine was

Table 3: Knowledge of HPV and HPV Vaccine among Participants (N=214)

Knowledge Item	Correct Response n (%)
Heard of HPV	197 (92.1)
HPV is caused by a virus	205 (95.8)
HPV is transmitted through sexual intercourse	200 (93.5)
HPV can cause cervical cancer	167 (78.0)
HPV can cause genital warts	139 (65.0)
Heard of HPV vaccine	184 (86.0)
Knew ideal age for vaccination (9-14 years)	115 (53.7)
Knew correct number of doses (2-3)	143 (66.8)
Knew where to get vaccinated	161 (75.2)

3.4. Factors Associated with HPV Vaccine Uptake

Bivariate analysis revealed several factors significantly associated with vaccine uptake (Table 4). Uptake was significantly higher among:

- Older students (21–25 years: 34.4% vs. 16–20 years: 9.8%; $p < 0.001$)
- Senior students (600-level: 69.2% vs. 100-level: 0%; $p < 0.001$)
- Those who were sexually active (36.2% vs. 13.8%; $p < 0.001$)
- Those with good HPV vaccine knowledge (37.8% vs. poor: 0%; $p < 0.001$)
- Those willing to pay for the vaccine (25.7% vs. 11.4%; $p = 0.016$)

Department and general HPV knowledge level were not significantly associated with uptake.

poorer. Only 53.7% knew the ideal vaccination age (9–14 years), and 66.8% knew the correct number of doses. Overall, 64.0% had good general HPV knowledge, but only 38.3% had good knowledge specifically about the HPV vaccine (Table 3).

Table 4: Factors Associated with HPV Vaccine Uptake (Bivariate Analysis)

Factor	Vaccinated n/N (%)	χ^2 (p-value)
Age Group		18.839 (<0.001)**
16-20 years	11/112 (9.8)	
21-25 years	32/93 (34.4)	
Level of Study		51.420 (<0.001)**
100	0/21 (0.0)	
600	18/26 (69.2)	
Sexual Activity		14.175 (<0.001)**
Yes	25/69 (36.2)	
No	20/145 (13.8)	
HPV Vaccine Knowledge		27.003 (<0.001)**
Good	31/82 (37.8)	
Poor	0/44 (0.0)	
Willing to Pay		5.773 (0.016)*
Yes	37/144 (25.7)	
No	8/70 (11.4)	

- $p < 0.05$, ** $p < 0.001$

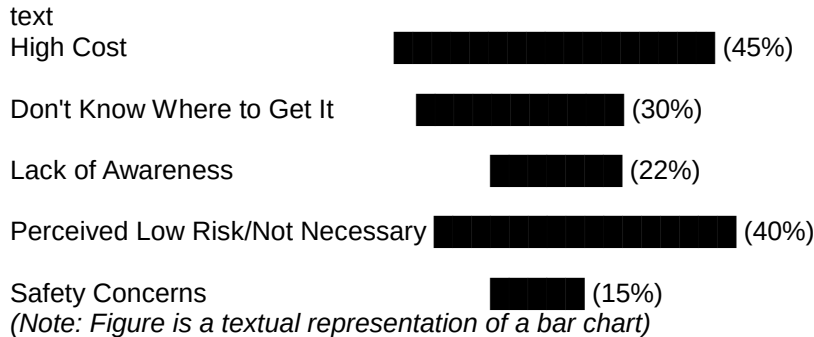
In binary logistic regression, after adjusting for confounders, being in a higher academic level (aOR=1.6, 95% CI: 1.3–2.0) and having good HPV vaccine

knowledge (aOR=4.5, 95% CI: 1.5–13.2) remained independent predictors of vaccine uptake.

3.5. Reasons for Non-Vaccination

Among the 169 unvaccinated students, the most cited barriers were: high cost (45%), not knowing where to get the vaccine (30%), lack of awareness of the vaccine (22%), and perceived low risk or lack of necessity (40%). Safety concerns accounted for 15% of responses.

Figure 1: Reasons for Non-Vaccination Among Female Medical Students (Multiple Responses Allowed)



4. DISCUSSION

This study revealed a low prevalence of HPV vaccination (21.0%) among female medical students at Rivers State University, with only about half of those initiating vaccination completing the recommended series. These findings are consistent with previous studies in Nigeria and other LMICs, underscoring a critical gap in cervical cancer prevention among a group expected to be at the forefront of health advocacy [12,13].

The significant association between higher academic level and vaccine uptake suggests that prolonged medical education may increase exposure to information about HPV-related cancers, thereby influencing health-seeking behavior. This aligns with studies that found clinical rotations and oncology modules to be catalysts for vaccination among medical students [10,14]. The strong link between good vaccine-specific knowledge and uptake highlights that general awareness of HPV is insufficient; detailed understanding of the vaccine's schedule, efficacy, and accessibility is crucial for decision-making. This corroborates findings from India and Saudi Arabia, where knowledge gaps directly predicted low uptake [15,16].

Contrary to the ideal of vaccination before sexual debut, our study found that sexually active students were more likely to be vaccinated. This may indicate a reactive rather than preventive approach, where perceived personal risk triggers action. It underscores the need to emphasize the benefits of pre-exposure vaccination within health education.

The financial barrier remains paramount, as identified in similar settings across sub-Saharan Africa [9,17]. The high out-of-pocket cost of the HPV vaccine in Nigeria is a formidable obstacle for students. The recent introduction of the HPV vaccine into Nigeria's national immunization schedule for younger adolescents is a positive step, but catch-up campaigns for older cohorts like university students are urgently needed [18].

The role of institutional health services is evident, as the most common vaccination site was the school/university clinic. This presents a clear opportunity: integrating affordable or subsidized HPV vaccination into campus health services could dramatically improve access and uptake, as demonstrated by successful school-based programs in Rwanda and Botswana [19,20].

4.1. Limitations

This study has limitations. Its cross-sectional design precludes causal inferences. The use of self-reported vaccination status may be subject to recall bias. The study was conducted in a single institution, which may limit generalizability. Nevertheless, the robust sampling method and high response rate strengthen the validity of the findings.

5. CONCLUSION AND RECOMMENDATIONS

HPV vaccine uptake among female medical students at Rivers State University is low, driven by inadequate vaccine-specific knowledge, financial constraints, and access barriers. Despite their medical training, these students are not adequately protected against a preventable cause of cervical cancer.

To address this, we recommend:

1. **Institutional Action:** The University Health Service should establish a routine, subsidized HPV vaccination program for all students, coupled with mandatory education sessions during orientation.
2. **Curriculum Review:** The medical curriculum should be enhanced to include detailed, practical modules on HPV vaccination guidelines and advocacy.
3. **Policy Advocacy:** The Nigerian government and health agencies should expand national HPV

vaccination campaigns to include catch-up vaccination for young adults in tertiary institutions.

4. **Public-Private Partnerships:** Partnerships with pharmaceutical companies and NGOs could facilitate vaccine donation or discount programs for university students.
5. **Digital Interventions:** Utilize SMS and social media reminders for dose completion and to disseminate credible information countering vaccine misinformation.

By implementing these multi-level strategies, Nigeria can improve HPV vaccine coverage among future healthcare professionals, thereby protecting their health and empowering them to become effective advocates for cervical cancer elimination in their communities.

6. DECLARATIONS

Ethical approval and consent to participate

Ethical approval for this study was obtained from the Rivers State University Teaching Hospital Research Ethics Committee. Written informed consent was obtained from all participants prior to data collection. Participation was voluntary and anonymity was maintained.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions

Aku-Emmanuel DC and Henry DF conceptualized the study, supervised data collection, performed data analysis, and drafted the manuscript. Nwadiuto I and Bademosi A provided methodological oversight, critically reviewed the manuscript for intellectual content, and approved the final version. All authors read and approved the final manuscript.

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Cite this Article: Bademosi, A; Nwadiuto, I; Aku-Emmanuel, DC; Henry, DC (2026). Determinants of Human Papillomavirus Vaccine Uptake among Female Medical Students at Rivers State University, Nigeria. *Greener Journal of Epidemiology and Public Health*, 14(1): 6-13, <https://doi.org/10.15580/gjeph.2026.1.020526024>.