International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Ilikannu SO et al. Int J Reprod Contracept Obstet Gynecol. 2026 Jul;15(7):2320-2331
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20262073

Original Research Article

Uptake of human papillomavirus vaccine among private and public female secondary school students in Asaba, Delta State, Nigeria: a comparative cross-sectional study

Samuel O. Ilikannu[1]*, Hillary O. Onomuighokpo[1], Chidinma G. Uzoma[2], Manna N. Onunkwo[3], Chikodili O. Ilikannu[4], Chiagozie Dan-Nwankwo[5], Omozele M. Uwadia[6], Ifeanyi Ofuani[7], Gabriel Dogbanya[8], Ngozi R. Maduka[9], Odigonma Z. Ikpeze[10], Chidinma P. Ohachenu[11], Prince O. Okinedo[12], Robinson O. Ogwu[1], Sylvia I. Obu[13], Ngozi E. Ezunu[14], Chukwujekwu I. Umenna[15], Isioma A. Orumade[16]

[1]Department of Obstetrics and Gynaecology. Federal Medical Centre Asaba, Delta State, Nigeria
[2]NHS Highland, Scotland, United Kingdom
[3]Royal Society for Public Health, United Kingdom
[4]Canada Research Clinics, Calgary, Alberta Canada
[5]Alberta Health Services, Alberta, Canada
[6]Department of Paediatrics, Federal Medical Centre, Asaba, Delta State, Nigeria
[7]Department of Urology, Federal Medical Centre, Asaba, Delta State, Nigeria
[8]Department of Family Science, University of Maryland, College Park, MD, USA
[9]Department of Obstetrics and Gynaecology, Central Hospital Agbor, Delta State, Nigeria
[10]Department of Obstetrics and Gynaecology, Nnamdi Azikiwe University Teaching Hospital, Anambra State, Nigeria
[11]Department of Obstetrics and Gynaecology, Korle Bu Teaching Hospital, Accra, Ghana
[12]Hepatitis Advocacy Foundation, Delta State, Nigeria
[13]Molecular Research Laboratory, Centre for Disease Control and Research, Federal Medical Centre, Delta State, Nigeria
[14]College of Nursing Science, Onicha-Uku, Delta State, Nigeria
[15]Department of Biology, The Catholic University of America, USA
[16]Department of Anaesthesia, University of Uyo Teaching Hospital, Akwa-Ibom State, Nigeria

Received: 06 December 2025
Accepted: 10 June 2026

***Correspondence:**
Dr. Samuel O. Ilikannu,
E-mail: dr.ilikannu@gmail.com

ABSTRACT

Background: Despite its availability, awareness and uptake of the human papillomavirus (HPV) vaccine have remained poor globally, especially in low and middle-income countries. The aim was to determine and compare the knowledge, attitude and uptake of HPV vaccine among private and public female secondary school students in Asaba, Delta State.
Methods: A comparative cross-sectional study of girls aged 10 and 18 years in public and private secondary schools in Asaba, Delta State. Interviewer-administered questionnaires were distributed to 200 eligible students after obtaining their assent and consent from their parents. The collected data were coded and analysed using SPSS version 26, and $p<0.05$ was considered significant.
Results: Only 24% (14% in private and 10% in public secondary schools), 14% (5% in private, 9% in public secondary schools) and 16% (6% in private, 10% in public secondary schools) of the respondents have heard of cervical cancer, HPV and HPV vaccine, respectively. There was a statistically significant association between school type and knowledge level ($p=0.048$). None of the respondents had received the HPV vaccine, with a lack of awareness being the reason for non-uptake in the majority of the respondents.
Conclusions: This study demonstrated poor knowledge of HPV/cervical cancer and a poor uptake of the HPV vaccine among respondents. Health education programs geared toward creating awareness among secondary school students and their parents in Delta State and other Nigerian states are highly recommended. Also, the government should make frantic efforts to sustain the HPV vaccine in the National Immunisation schedule.

Keywords: Human papillomavirus, HPV vaccine, Cervical cancer, Knowledge, Uptake

INTRODUCTION

Cervical cancer remains a significant global health challenge, predominantly caused by persistent infection with high-risk strains of the human papilloma virus (HPV).[1-4] Several studies have established a strong link between HPV and cervical cancer, leading to the development of prophylactic vaccines aimed at preventing infection and reducing disease incidence.[4] These vaccines have revolutionized cervical cancer prevention, offering a highly effective strategy when administered before exposure to the virus.

The World Health Organisation (WHO) recommends vaccinating girls between 9 and 14 years before their first sexual intercourse, ensuring maximum protection.[5] Additionally, boys are now recognised as secondary vaccination targets due to their role in HPV transmission. Vaccinating older females who have not been previously exposed to HPV also provides significant protective benefits.[5] Currently, three FDA-approved vaccines - Gardasil, Cervarix, and Gardasil 9 are widely used. Gardasil protects against HPV types 6, 11, 16, and 18, while Cervarix targets HPV 16 and 18, the two most oncogenic strains. Gardasil 9 expands coverage to nine HPV types, providing protection against an expanded range of HPV types, including 6, 11, 16, 18, 31, 33, 45, 52, and 58, further enhancing protection against cervical and other HPV-related cancers.[6]

Despite the availability of these vaccines, uptake remains significantly low, especially in low and middle-income countries (LMICs) such as Nigeria. Some studies have highlighted that limited awareness regarding the link between HPV and cervical cancer, as well as the potential benefits of vaccination, cultural beliefs, vaccine hesitancy, and economic constraints, serve as major barriers to HPV vaccination in these regions.[7-8] Additionally, the high cost of HPV vaccines makes them inaccessible to many, particularly in countries where they are not included in National Immunization Programs.[9] The absence of the vaccine from national immunisation initiatives can contribute to the perpetuation of low vaccine coverage. As a result, the burden of cervical cancer, a preventable disease, continues to disproportionately affect these regions. In recent years, a disturbing decline in HPV vaccination coverage has been observed globally. Between 2019 and 2021, the first-dose coverage dropped from 25% to 15%, resulting in an additional 3.5 million girls missing HPV vaccination in 2021 compared to 2019.[5] The COVID-19 pandemic further exacerbated the situation by disrupting routine healthcare services, limiting vaccine availability, and increasing vaccine hesitancy. In response, WHO introduced a single-dose HPV vaccine schedule, which has been found to provide comparable protection to the traditional two-dose regimen.[5] This simplified schedule aims to improve vaccine accessibility and reduce logistical challenges in resource-limited settings.

Cervical cancer is the fourth most common cancer among women worldwide, with an estimated 604,000 new cases and 342,000 deaths recorded in 2020.[10-11] This alarming prevalence highlights the urgent need for enhanced awareness, prevention, and treatment efforts to combat the devastating impact of this disease. A staggering 90% of cases occur in LMICs, where limited healthcare infrastructure, poor screening programs, and low vaccination rates contribute to high mortality.[10] In Nigeria, cervical cancer ranks as the second most prevalent cancer among women aged 15-44 years, with an annual incidence of 14,943 new cases.[12,13] The disease remains the second leading cause of cancer-related deaths in the country due to late-stage diagnosis, limited access to treatment, and lack of national vaccination programs.[14] Additionally, an estimated 53.1 million Nigerian women aged 15 and above are at risk of developing cervical cancer.[13] To combat the rising burden of cervical cancer, a comprehensive approach is needed, incorporating vaccination, routine screening, public health education, and improved healthcare policies. Governments and health organisations must work towards increasing vaccine accessibility, integrating HPV vaccination into national immunisation schedules, and addressing socioeconomic barriers preventing uptake. Expanding awareness campaigns targeting students, parents, and educators is crucial to dispelling myths and encouraging vaccine acceptance. By implementing these strategies, HPV-related cervical cancer cases can be significantly reduced, particularly in high-burden regions like Nigeria.

Many of the studies done analysed the knowledge and uptake of HPV vaccines among undergraduate students, leaving the target population whose age falls in the secondary level of education. Also, many of the works carried out on secondary school students have not compared the uptake of the HPV vaccine amongst students in private and public secondary schools. Hence, this study is aimed at comparing the uptake of the HPV vaccine among female students in private and public secondary schools in Asaba, Delta State, whose age group belong to the recommended age for commencement of HPV vaccines. This study will therefore generate data that would aid policy formulation in enhancing the uptake of the HPV vaccine, ultimately leading to a reduction in the incidence and prevalence of cervical cancer at large.

METHODS

Study area

This study was carried out in Asaba, the capital of Delta state, an oil rich state in the south geopolitical zone of Nigeria.

Study design

A comparative cross-sectional study was carried out between 01 May and 30 June 2023 to determine and compare the knowledge, attitude and uptake of HPV

vaccine among private and public female secondary school students in Asaba, Delta state Nigeria.

Study population

Within this urban expanse, a total of 13 public secondary schools and 55 private secondary schools comprised the study population. These schools, predominantly characterized as co-educational institutions, facilitate the joint learning journey of both male and female students. The female students in these schools made up the study population.

Inclusion criteria

Female secondary school students aged between 10 and 18 years, enrolled in either private or public secondary schools in Asaba, Delta state and present in school on the day of the interview. Participants who provide written informed consent, and for minors, assent, along with parental or guardian consent, participants in good general health, without any known medical conditions that may affect their ability to participate in the study, and are willing to voluntarily participate in the study without any form of coercion.

Exclusion criteria

Male secondary school students, female SS3 students who were writing their Senior West Africa Council Examination during the time of data collection, participants without proper written informed consent or, for minors, lacking both assent and parental or guardian consent, individuals with known medical conditions that may hinder their full participation in the study, unwillingness to participate in the study, students who cannot effectively communicate in English language.

Sample size calculation

The sample size was determined using the formula.[15]

$$n = (Z_{a/2} + Z_b)^2 P_1(1 - P_1) + P_2(1 - P_2)/(P_1 - P_2)^2$$

Where, n = the desired or minimum sample size, $Z_{a/2}$=standard normal deviate, usually set at 1.96, which corresponds to a 95% confidence level, and Z_b=0.842 (from Z table) at 80% power.

P_1=42.2%=0.422; the prevalence of female secondary school students in public schools with good knowledge about HPV and its vaccine in a previous study.[16]

P_2=57.8%=0.578; the prevalence of female secondary school students in private schools with good knowledge about HPV and its vaccine in a previous study.[16]

$$n = ((1.96 + 0.84)^2 \times 0.422(1 - 0.422) + 0.578(1 - 0.578))/(0.422 + 0.578)^2$$

Assuming a 10% non-response rate;

$$n = 88.6 => 10/100 \times 88.6 = 8.86$$

The total sample size will therefore be 88.6 + 8.86 = 97.46, approximately 98 respondents.

To account for a design effect of 2,

$$Final\ sample\ size = 98 \times 2 = 196\ students$$

Hence, 98 female students in private and 98 female students in public secondary schools in Asaba, Delta State.

Sampling methods

A multi-stage sampling technique was used to recruit students for this study.

Stage one

Following the acquisition of a list of all secondary schools in Asaba, stratified sampling was adopted to divide the population into strata using school status as criteria for stratification. Schools were thus divided into two main groups - private and public secondary schools. This was followed by the selection of secondary schools by simple random sampling from the list of registered secondary schools in Asaba. Two schools, each selected from private (Graceville College and St Philips Anglican Secondary School) and public secondary schools in Asaba (West-End Mixed Secondary School and Zappa Mixed Secondary School) – a total of four schools.

Stage two

Stage two involved the meticulous selection of respondents through a systematic application of simple random sampling, ensuring a rigorous and unbiased approach. A comprehensive class list of the designated secondary schools was first compiled. Subsequently, each student in the list was assigned a unique identifier, and a random number generator was employed to select participants without any inherent pattern or bias. This process guarantees that every student has an equal chance of being chosen.

Data collection

After selecting the participating secondary schools and obtaining ethical approval, the research team contacted the Delta state ministry of basic and secondary education and the selected schools in Asaba to gain permission to conduct the study. The schools were visited to deliver informed consent forms describing the study purpose and procedures for parents. Only students with parental consent were eligible to participate.

The questionnaire was adapted from similar studies and was reviewed by experts in public health and paediatrics,

and comprised four sections, namely: the sociodemographic parameters, knowledge of HPV, HPV vaccine and cervical cancer, attitude towards the uptake of HPV vaccine and the uptake of HPV vaccine among respondents and associated factors. Also, a small pilot administration of the study tool was given to a small set of female secondary school students before the commencement of the study, and their comments and feedback revealed no ambiguity.

For knowledge assessment, a total of 12 items were used to assess respondents' knowledge about HPV, HPV vaccines, and cervical cancer. Each correct answer attracts a score of 1, and each wrong answer attracts a score of 0. The total score obtainable was 12.

Respondents who scored between 0-6 were graded to have a poor knowledge, while those who scored 7-12 were graded to have a good knowledge about HPV, HPV vaccine, and cervical cancer.

For attitude assessment toward HPV vaccine, this was done using seven (7) Likert-scale items. Responses were dichotomized into positive and negative categories. A composite score was computed, and respondents with scores ≥5 were classified as having a positive attitude, while those with scores ≤4 were classified as having a negative attitude. On scheduled survey days, students with parental consent assembled in classrooms. Trained research assistants explained the survey processes and gained student assent. The interviewer-administered questionnaire was conducted among the selected students. Students were given privacy while answering sensitive questions. The survey required 10-20 minutes of time to complete, and was conducted over several days until the desired sample size was reached. Identifiers were removed, and data anonymised to maintain confidentiality.

Data analysis

After data collection, each questionnaire was given a unique code and entered into international business machines corporation-statistical package for the social sciences (IBM-SPSS) version 26 for Windows. Results were aggregated and presented as whole numbers with frequencies and percentages.

Categorical variables were compared using a chi-square test or Fisher's exact, where appropriate, while continuous variables were compared using the t-test. Results were statistically significant if the $p<0.05$.

Ethical consideration

Ethical approval was obtained from the Ethics and Research Department of the University of Port Harcourt and also from the Research and Ethics Committee of the Federal Medical Centre, Asaba, in conformity with the Helsinki declaration, with emphasis on the core ethical principles of autonomy, beneficence, non-maleficence and justice.[17] Also, approval from the Delta State Ministry of Education and permission from the selected schools were obtained before the commencement of the study.

The details of the study were conveyed in simple English language understood by the students. This involved clear interpretation of the study methods, benefits and risks of the study before obtaining informed consent and recruiting them into the study.

RESULTS

A total of 200 female secondary school students participated in this study (100 from private and 100 from public secondary schools in Asaba, Delta State) (Table 1). Table 1 shows the sociodemographic characteristics of respondents. The mean age of the respondents was lower in private schools (12.66±1.53 versus 14.08±1.83 years). The 13–15-year age group was the most represented in both private (52.0%) and public (51.0%) schools. Parental educational attainment was markedly higher in the private school group as 91.0% of both fathers and mothers held tertiary qualifications, compared with 44.0% of fathers and 36.0% of mothers in the public-school group. Trading was the most common paternal occupation in both groups (private 38.0%, public 32.0%). Among mothers, civil service (36.0%) and entrepreneurship (34.0%) predominated in the private school group, whereas trading was the most common occupation among public school mothers (61.0%).

Table 2 shows respondents' knowledge of HPV, HPV vaccine, cervical cancer and their source(s) of knowledge, while figure 1 shows that only 5% and 13% of the female respondents in private and public secondary schools respectively had good knowledge of HPV, HPV vaccine and cervical cancer. There was a statistically significant association between school type and knowledge level ($\chi2=3.907$, $p=0.048$), with a small effect size (Cramer's $V=0.14$).

Table 3 shows the association between sociodemographic characteristics and knowledge level among female private school respondents. No statistically significant association was found between knowledge level and any sociodemographic variable examined.

Table 4 shows the association between sociodemographic characteristics and knowledge level among female public-school respondents (n=100). Class level was significantly associated with knowledge among public school students ($\chi2=11.714$, $p=0.008$), with a moderate effect size (Cramer's $V=0.34$). The highest proportion of good knowledge was recorded among JSS 3 students (33.3%).

Table 1: Relative risk of abnormal Doppler indices with adverse perinatal outcome.

Variables		Private school, N (%)	Public school, N (%)
Mean age		12.66±1.53	14.08±1.83
Age group (years)	10-12	46 (46.0)	24 (24.0)
	13-15	52 (52.0)	51 (51.0)
	16-18	2 (2.0)	25 (25.0)
Class	JSS 1	22 (22.0)	20 (20.0)
	JSS 2	20 (20.0)	20 (20.0)
	JSS 3	20 (20.0)	21 (21.0)
	SSS 1	18 (18.0)	20 (20.0)
	SSS 2	20 (20.0)	19 (19.0)
Religion	Christianity	100 (100.0)	99 (99.0)
	Islam	0 (0.0)	1 (1.0)
Ethnicity/tribe	Igbo	58 (58.0)	75 (75.0)
	Hausa	1 (1.0)	1 (1.0)
	Yoruba	4 (4.0)	1 (1.0)
	Others	37 (37.0)	23 (23.0)
Father's highest level of education	None	0 (0.0)	3 (3.0)
	Primary	2 (2.0)	13 (13.0)
	Secondary	7 (7.0)	40 (40.0)
	Tertiary	91 (91.0)	44 (44.0)
Mother's highest level of education	None	0 (0.0)	4 (4.0)
	Primary	0 (0.0)	12 (12.0)
	Secondary	9 (9.0)	48 (48.0)
	Tertiary	91 (91.0)	36 (36.0)
Father's occupation	Artisan	5 (5.0)	24 (24.0)
	Civil servant	35 (35.0)	20 (20.0)
	Entrepreneur	21 (21.0)	19 (19.0)
	Trading	38 (38.0)	32 (32.0)
	Unemployed	1 (1.0)	5 (5.0)
Mother's occupation	Artisan	1 (1.0)	5 (5.0)
	Civil servant	36 (36.0)	11 (11.0)
	Entrepreneur	34 (34.0)	16 (16.0)
	Trading	25 (25.0)	61 (61.0)
	Unemployed	4 (4.0)	7 (7.0)

Table 2: Respondents' knowledge of HPV, HPV vaccine, and cervical cancer.

Variables		Private school, N (%)	Public school, N (%)
Heard of cervical cancer before	Yes	14 (14.0)	10 (10.0)
	No	86 (86.0)	90 (90.0)
Cervical cancer can be transmitted via sexual intercourse	Yes	11 (11.0)	24 (24.0)
	No	8 (8.0)	8 (8.0)
	I don't know	81 (81.0)	68 (68.0)
Cervical cancer can be screened by a pap smear test	Yes	8 (8.0)	13 (13.0)
	No	5 (5.0)	3 (3.0)
	I don't know	87 (87.0)	84 (84.0)
Have you heard of HPV?	Yes	5 (5.0)	9 (9.0)
	No	95 (95.0)	91 (91.0)
HPV can be sexually transmitted	Yes	10 (10.0)	24 (24.0)
	No	6 (6.0)	1 (1.0)
	I don't know	84 (84.0)	75 (75.0)
HPV can cause cervical cancer	Yes	8 (8.0)	28 (28.0)
	No	3 (3.0)	3 (3.0)
	I don't know	89 (89.0)	69 (69.0)
Have you heard of HPV vaccines?	Yes	6 (6.0)	10 (10.0)
	No	94 (94.0)	90 (90.0)

Continued.

Variables		Private school, N (%)	Public school, N (%)
HPV vaccine can protect against HPV infection	Yes	48 (48.0)	33 (33.0)
	No	0 (0.0)	5 (5.0)
	I don't know	52 (52.0)	62 (62.0)
HPV vaccine can prevent against cervical cancer	Yes	15 (15.0)	31 (31.0)
	No	3 (3.0)	3 (3.0)
	I don't know	82 (82.0)	66 (66.0)
Who should get the HPV vaccine?	Males	1 (1.0)	0 (0.0)
	Females	19 (19.0)	19 (19.0)
	Both	37 (37.0)	34 (34.0)
	I don't know	43 (43.0)	47 (47.0)
The recommended dose of HPV vaccine	1 dose	6 (6.0)	6 (6.0)
	2 doses	1 (1.0)	3 (3.0)
	3 doses	2 (2.0)	1 (1.0)
	I don't know	91 (91.0)	90 (90.0)
Route of vaccination	Skin patches	1 (1.0)	1 (1.0)
	Oral	0 (0.0)	4 (4.0)
	Injection	19 (19.0)	11 (11.0)
	I don't know	80 (80.0)	84 (84.0)
Sources of information	TV/Radio	3 (3.0)	3 (3.0)
	Teacher	3 (3.0)	8 (8.0)
	Social media	5 (5.0)	1 (1.0)
	Parents	3 (3.0)	3 (3.0)
	Newspapers/magazines	8 (8.0)	2 (2.0)
	Health care worker	3 (3.0)	19 (19.0)
	Books	4 (4.0)	1 (1.0)
	Others	0 (0.0)	2 (2.0)
	None	71 (71.0)	61 (61.0)

Table 3: Association between socio-demographic characteristics and knowledge amongst respondents from private schools (n=100).

Variables		Knowledge level, N (%)		$\chi 2$	P value
		Poor knowledge	Good knowledge		
Age group (years)	10-12	43 (93.5)	3 (6.5)	1.189[F]	0.696
	13-15	50 (96.2)	2 (3.8)		
	16-18	2 (100.0)	0 (0.0)		
Class	JSS 1	20 (90.9)	2 (9.1)	3.810[F]	0.394
	JSS 2	19 (95.0)	1 (5.0)		
	JSS 3	20 (100.0)	0 (0.0)		
	SSS 1	16 (88.9)	2 (11.1)		
	SSS 2	20 (100.0)	0 (0.0)		
Religion	Christianity	95 (95.0)	5 (5.0)	-	-
	Islam	0 (0.0)	0 (0.0)		
Ethnicity/tribe	Igbo	54 (93.1)	4 (6.9)	2.311[F]	0.727
	Hausa	1 (100.0)	0 (0.0)		
	Yoruba	4 (100.0)	0 (0.0)		
	Others	36 (97.3)	1 (2.7)		
Father's highest level of education	Primary	2 (100.0)	0 (0.0)	2.658[F]	0.382
	Secondary	6 (85.7)	1 (14.3)		
	Tertiary	87 (95.6)	4 (4.4)		
Mother's highest level of education	Secondary	8 (88.9)	1 (11.1)	0.778[F]	0.378
	Tertiary	87 (95.6)	4 (4.4)		
Father's occupation	Artisan	5 (100.0)	0 (0.0)	3.011[F]	0.663
	Civil servant	33 (94.3)	2 (5.7)		
	Entrepreneur	21 (100.0)	0 (0.0)		
	Trading	35 (92.1)	3 (7.9)		
	Unemployed	1 (100.0)	0 (0.0)		

Continued.

Variables		Knowledge level, N (%)		χ2	P value
		Poor knowledge	Good knowledge		
Mother's occupation	Artisan	1 (100.0)	0 (0.0)	2.766[F]	0.717
	Civil servant	35 (97.2)	1 (2.8)		
	Entrepreneur	32 (94.1)	2 (5.9)		
	Trading	23 (92.0)	2 (8.0)		
	Unemployed	4 (100.0)	0 (0.0)		

*Significant, F=Fisher's Exact test used

Table 4: Association between Socio-demographic characteristics and knowledge amongst respondents from public schools (n=100).

Variables		Knowledge level, N (%)		χ2	P value
		Poor knowledge	Good knowledge		
Age group (years)	10-12	20 (83.3)	4 (16.7)	0.524[F]	0.859
	13-15	45 (88.2)	6 (11.8)		
	16-18	22 (88.0)	3 (12.0)		
Class	JSS 1	16 (80.0)	4 (20.0)	11.714[F]	0.008*
	JSS 2	19 (95.0)	1 (5.0)		
	JSS 3	14 (66.7)	7 (33.3)		
	SSS 1	19 (95.0)	1 (5.0)		
	SSS 2	19 (100.0)	0 (0.0)		
Religion	Christianity	87 (87.9)	12 (12.1)	6.760[F]	0.130
	Islam	0 (0.0)	1 (100.0)		
Ethnicity/tribe	Igbo	65 (86.7)	10 (13.3)	5.224[F]	0.236
	Hausa	1 (100.0)	0 (0.0)		
	Yoruba	0 (0.0)	1 (100.0)		
	Others	21 (91.3)	2 (8.7)		
Father's highest level of education	None	3 (100.0)	0 (0.0)	1.086[F]	0.769
	Primary	12 (92.3)	1 (7.7)		
	Secondary	33 (82.5)	7 (17.5)		
	Tertiary	39 (88.6)	5 (11.4)		
Mother's highest level of education	None	3 (75.0)	1 (25.0)	1.237[F]	0.792
	Primary	11 (91.7)	1 (8.3)		
	Secondary	42 (87.5)	6 (12.5)		
	Tertiary	31 (86.1)	5 (13.9)		
Father's occupation	Artisan	22 (91.7)	2 (8.3)	4.398[F]	0.315
	Civil servant	19 (95.0)	1 (5.0)		
	Entrepreneur	14 (73.7)	5 (26.3)		
	Trading	27 (84.4)	5 (15.6)		
	Unemployed	5 (100.0)	0 (0.0)		
Mother's occupation	Artisan	5 (100.0)	0 (0.0)	2.069[F]	0.719
	Civil servant	10 (90.9)	1 (9.1)		
	Entrepreneur	14 (87.5)	2 (12.5)		
	Trading	53 (86.9)	8 (13.1)		
	Unemployed	5 (71.4)	2 (28.6)		

*Significant, F=Fisher's exact test used

Table 5 shows respondents' attitudes toward the uptake of the HPV vaccine in private schools. The majority (63.0%) were undecided as to whether the HPV vaccine is effective in preventing cervical cancer, most respondents (69.0%) agreed that their parents must decide whether they take the vaccine, and 80.0% agreed they would need more information before doing so. Support for inclusion of the HPV vaccine in the National Programme on Immunisation was expressed by 68.0%.

Table 6 shows respondents' attitudes toward the uptake of the HPV vaccine in public schools. 37% percent agreed that the vaccine is effective in preventing cervical cancer, while 54.0% were undecided. About 62% of the respondents agreed that their parents must decide on vaccination, 69% agreed they would need more information before taking the vaccine, and 74.0% supported its inclusion in the National Programme on Immunisation.

Attitude was classified as positive (composite score ≥5) or negative (≤4). The 7-item scale had acceptable internal consistency (Cronbach's α=0.71). The majority of respondents in both groups had a negative overall attitude toward HPV vaccination (Figure 2). There was no statistically significant difference in overall attitude between school types (χ^2=3.106, p=0.078), although a small effect size was observed Cramer's V=0.12).

Table 7 shows the relationship between attitude and knowledge. Among respondents with a negative attitude, no statistically significant association with knowledge level was observed in either school type (p=0.624). Among respondents with a positive attitude, school type was significantly associated with knowledge level (χ^2=5.105, p=0.024, Cramer's V=0.28).

Table 8 shows the exposure to HPV and uptake of the HPV vaccine among respondents. None of the private school respondents reported prior sexual activity, whereas 9.0% of public school respondents acknowledged having had sexual intercourse. Among the sexually active public school respondents, the age of sexual debut ranged from 12 to 16 years. No respondent in either group had ever received the HPV vaccine, representing an uptake rate of 0% across both school types. Willingness to receive the vaccine in the future was expressed by 17.0% of private school respondents and 26.0% of public school respondents. Lack of awareness was the most frequently cited reason for non-uptake in both groups (private 84.0%; public 71.0%), followed by parental disapproval (private 5.0%; public 13.0%).

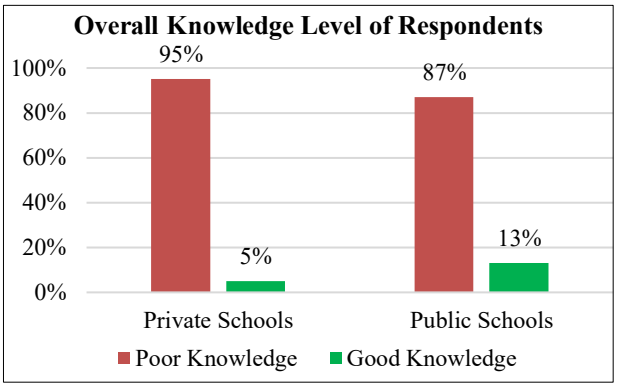

Figure 1: Overall respondent's knowledge level about HPV, HPV vaccine, and cervical cancer.

Table 5: Respondents' attitude toward the uptake of HPV vaccine (private schools).

S. no.	Variables	D, N (%)	U, N (%)	A, N (%)	Mean	σ
1	The HPV vaccine is effective in preventing cervical cancer	5 (5.0)	63 (63.0)	32 (32.0)	2.27	0.55
2	I will take the HPV vaccine because I feel at risk of getting HPV infection	11 (11.0)	65 (65.0)	24 (24.0)	2.13	0.58
3	My parents must be the ones to decide whether I take the HPV vaccine or not	6 (6.0)	25 (25.0)	69 (69.0)	2.63	0.60
4	I will use the vaccine if it is available in the clinic to students at a reduced price or at no cost at all	15 (15.0)	54 (54.0)	31 (31.0)	2.16	0.66
5	More information on HPV and its vaccine will be needed before I take the vaccine	0 (0.0)	20 (20.0)	80 (80.0)	2.80	0.40
6	HPV vaccination should be included in the National program on immunization	0 (0.0)	32 (32.0)	68 (68.0)	2.68	0.47
7	HPV vaccine may have a long-term negative effect on me	10 (10.0)	82 (82.0)	8 (8.0)	1.98	0.43

N=100; D: disagree; U: undecided; A: agree; σ: standard deviation

Table 6: Respondents' attitude toward the uptake of HPV vaccine (public schools).

S. no.	Variables	D, N (%)	U, N (%)	A, N (%)	Mean	σ
1	The HPV vaccine is effective in preventing cervical cancer	9 (9.0)	54 (54.0)	37 (37.0)	2.28	0.62
2	I will take the HPV vaccine because I feel at risk of getting HPV infection	8 (8.0)	62 (62.0)	30 (30.0)	2.22	0.58
3	My parents must be the ones to decide whether I take the HPV vaccine or not	6 (6.0)	32 (32.0)	62 (62.0)	2.56	0.61
4	I will use the vaccine if it is available in the clinic to students at a reduced price or at no cost at all	9 (9.0)	55 (55.0)	36 (36.0)	2.27	0.62
5	More information on HPV and its vaccine will be needed before I take the vaccine	5 (5.0)	26 (26.0)	69 (69.0)	2.64	0.58
6	HPV vaccination should be included in the National program on immunization	4 (4.0)	22 (22.0)	74 (74.0)	2.70	0.54
7	HPV vaccine may have a long-term negative effect on me	19 (19.0)	60 (60.0)	21 (21.0)	2.02	0.64

N=100; D: disagree; U: undecided; A: agree; σ: standard deviation

Table 7: Relationship between attitude and knowledge.

Attitude	Knowledge	Private school, N (%)	Public school, N (%)	χ2	P value	Cramer's V
Negative	Poor knowledge	76 (96.2)	67 (98.5)	0.747[F]	0.624	
	Good knowledge	3 (3.8)	1 (1.5)			
Positive	Poor knowledge	19 (90.5)	20 (62.5)	5.105	0.024*	0.28
	Good knowledge	2 (9.5)	12 (37.5)			

*Significant, F=Fisher's Exact test used

Table 8: Exposure to HPV and uptake of HPV vaccine among the respondents (n=200).

Variable	Private school, N (%)	Public school, N (%)
Have you had sex before?		
Yes	0 (0.0)	9 (100.0)
No	100 (100.0)	91 (91.0)
If yes, at what age was your first sex? (n=9)		
12	-	1 (11.1)
13	-	3 (33.3)
14	-	1 (11.1)
15	-	2 (22.2)
16	-	2 (22.2)
Have you ever received the HPV vaccine?		
No	100 (100.0)	100 (100.0)
Are you willing to take the HPV vaccine?		
Yes	17 (17.0)	26 (26.0)
No	83 (83.0)	74 (74.0)
Reason for not being vaccinated		
I am not aware of the vaccine	84 (84.0)	71 (71.0)
I do not want to receive the vaccine	2 (2.0)	5 (5.0)
I don't have HPV	1 (1.0)	0 (0.0)
It may have side effects	1 (1.0)	0 (0.0)
My parents will not allow me to take the vaccine	5 (5.0)	13 (13.0)
Other reasons	0 (0.0)	4 (4.0)
No reason	7 (7.0)	7 (7.0)

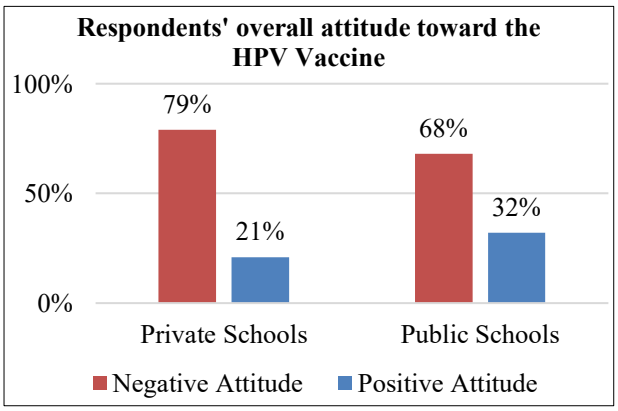

Figure 2: Respondents' overall attitude toward the HPV vaccine.

DISCUSSION

This comparative cross-sectional study examined the knowledge, attitude, and uptake of the HPV vaccine among 200 female secondary school students drawn from private and public secondary schools in Asaba, Delta State, Nigeria. The mean age of respondents was 12.66±1.53 years in private schools and 14.08±1.83 years in public schools. The predominance of respondents in the 13–15-year age group across both strata places the majority within the WHO-recommended primary vaccination window of 9–14 years, confirming that this study targeted the appropriate population for HPV immunisation.[5] The substantially higher parental educational attainment in the private school group (91.0% tertiary for both fathers and mothers) compared with the public-school group (44.0% of fathers and 36.0% of mothers) reflects the well-documented socioeconomic stratification associated with school type in Nigeria, where private school enrolment presupposes a level of household income and parental education unavailable to lower-income families. This socioeconomic differentiation is relevant to interpreting findings across all domains of this study.

Knowledge of cervical cancer, HPV, and the HPV vaccine was generally poor across both school types. Only 24% (14% private school and 10% public school), 14% (5% private school and 9% public school, and 16% (6% private school and 10% public school) respondents had previously heard of cervical cancer, HPV and HPV vaccines,

respectively. This was similar to the findings by Fehintola et al in Ile-Ife, Ojeleye et al in Lagos, Ezeanochie et al in Benin, Ifediora et al in Anambra, and Ndikom et al in Ibadan, all of whom studied the subject matter among female secondary school students in Nigeria.[8,16,18-20] The low awareness in the present study and other similar studies shows the limited penetration of reproductive health topics in the Nigerian education curriculum.

Our study showed a statistically significant difference between school type and the overall knowledge level of the respondents. The students in the public secondary schools had a better knowledge than their public counterparts on HPV, HPV vaccine and cervical cancer. This was different from the finding of Ojeleye et al in Lagos who found that students in private schools had better knowledge than their public-school counterparts.[16] This difference in their results may have been due to the heterogeneous population of their study, which included both male and female students. Also, the reproductive health programmes and campaigns of the Delta State Ministry of Health in collaboration with the State's Ministry of Education in Public (government-owned) schools may have also played a role.

Class level also had a significant association with knowledge level among respondents in public secondary schools in our study as students in the JSS3 class demonstrated good knowledge of the subject matter than their counterparts in other classes. This was also similar to the finding by Ojeleye et al in Lagos, where students in the exit exam classes of JSS3 and SSS3 had better knowledge than their counterparts in other classes.[16] The JSS3 class is an examination class where students write an exit exam that takes them to the senior secondary classes. Hence, during the course of exam preparation, they may have encountered teachings on cervical cancer, HPV and HPV vaccine, which further improved their knowledge. Our study did not capture the SSS3 students as they were writing their exit exams during the period of data collection.

The overall attitude toward HPV vaccination was predominantly negative in both school types, with no statistically significant difference between them. Ndikom et al reported a similarly negative attitudinal profile among secondary school students in Ibadan and found that negative attitude was significantly associated with lack of awareness of the vaccine and its benefits, a pattern clearly replicated in the present study.[20] The widespread agreement that additional information would be needed before consenting to vaccination (80.0% private; 69.0% public) should not be interpreted as entrenched vaccine hesitancy, but as a modifiable information deficit. Jalani et al in their study among secondary school students in rural Malaysia found that providing structured information sessions about the HPV vaccine resulted in a statistically significant improvement in both knowledge scores and willingness to accept the vaccine, demonstrating that such deficits are correctable through targeted educational intervention.[20] Kristina et al, in a systematic review across developing South-East Asian economies, concluded that knowledge-based interventions were the most effective single modality for improving HPV vaccine acceptance across diverse settings.[22] Despite the predominantly negative overall attitude, 68.0% of private school respondents and 74.0% of public school respondents supported inclusion of the HPV vaccine in the National Programme on Immunisation, indicating a latent receptiveness that could be activated through targeted health education.

The significance of early health education is further underscored by findings on sexual activity in this study. None of the private school respondents reported prior sexual activity, whereas 9.0% of public-school respondents acknowledged having had sexual intercourse, with debut as early as age 12 years. The low socioeconomic status of respondents in the public secondary schools may have contributed to this scenario. The WHO-recommended vaccination window of 9-14 years is designed specifically to precede sexual initiation, and the present data confirm that a proportion of the public-school population has already crossed this threshold, reinforcing the critical need to initiate vaccination for young school girls early enough as stipulated in the WHO guidelines.[5]

Concerns about long-term adverse effects of the vaccine were not a dominant driver of negative attitudes in this cohort, endorsed by only 8.0% of private school respondents and 21.0% of public-school respondents. This is noteworthy because vaccine safety concerns have been identified as a major barrier in other settings. Nhumba and Sunguya, in a study of second-dose HPV vaccine completion in Dar es Salaam, Tanzania, found that fear of side effects accounted for 31.2% of non-completion, making it the second most frequently cited barrier after parental refusal.[23] The comparatively low safety concern rate in the present study suggests that the primary challenge in the Asaba context is not hesitancy rooted in safety fears, but rather a fundamental absence of awareness and structural access, both of which are more tractable problems from a public health intervention standpoint.

The strong endorsement of parental authority in vaccination decision-making was a particularly striking finding, reported by 69.0% of private school respondents and 62.0% of public-school respondents. This was also similar to the findings by Ojeleye et al in Lagos, and Ndikom et al in Ibadan. Nabirye et al in a study of health system factors influencing HPV vaccine uptake among adolescent girls in Mbale District, Uganda, identified parental and community acceptance as the most pivotal determinants of vaccine uptake, noting that adolescents who perceived parental disapproval were significantly less likely to accept the vaccine, irrespective of their own knowledge or attitude.[16,20,24,25] Similarly, Kabakama et al in a systematic review of HPV vaccination procedures across low- and middle-income countries, found that social

mobilisation strategies specifically targeting parents and community leaders were associated with substantially higher uptake rates compared with student-only education interventions, a finding that directly supports the necessity of incorporating structured parental sensitisation as a core component of any school-based HPV vaccination programme in the Asaba context.

The HPV vaccine uptake rate was 0.0% across both school types in our study. Similar findings of low HPV vaccine uptake among female secondary school students have also been recorded by various authors such as Fehintola et al in Ile-Ife (2.8%), Ezeanochie et al in Benin (0.5%), and Ndikom et al in Ibadan (4.1%). This finding underscores the need for awareness creation and the integration of the HPV vaccine into the National Program on Immunisation at no cost to young school girls. Perlman et al in a systematic review across Sub-Saharan Africa, concluded that awareness is the single most proximal determinant of vaccine uptake in the region, and that in sub-Saharan settings, structural access barriers amplify the effect of knowledge deficits more than in high-income countries.[25] In the present study, lack of awareness was cited by 84.0% of private and 71.0% of public-school respondents as the reason for non-uptake, directly confirming this conclusion.

Despite zero uptake, 17.0% of private school respondents and 26.0% of public-school respondents expressed willingness to receive the vaccine in the future. Guodong et al studying HPV vaccine dose completion and adherence among commercially insured females in the United States, demonstrated that initial acceptance is a necessary but insufficient precursor to schedule completion, and that school-based delivery with cost elimination were the structural modifications most strongly associated with full dose completion.[26,28] This implies that even the modest future willingness expressed in the present study could be effectively harnessed if structural barriers were addressed through a school-based delivery programme. Parental disapproval was the second most commonly cited barrier to uptake (5.0% private; 13.0% public), with the higher rate in the public-school group consistent with the lower parental educational attainment in that group. Nabirye et al documented that parental refusal accounted for 38.7% of non-uptake cases in Uganda and was most prevalent in households with lower maternal educational attainment, a pattern directly analogous to the present findings.[24]

This study has some limitations that should be acknowledged. The cross-sectional design precludes causal inference, and all associations reported are observational. The study was conducted only in four schools within Asaba, an urban state capital, which limits generalisability to rural communities in Delta State and to other geopolitical zones of Nigeria, where access to information, parental educational attainment, and healthcare worker engagement may differ substantially. Self-reported data are inherently susceptible to social desirability bias, particularly for sensitive items such as sexual activity, which may have resulted in underreporting of sexual experience especially among private school respondents.

The study was restricted to in-school female adolescents and therefore excludes out-of-school girls, who may represent a higher-risk subgroup with lower health literacy and less access to preventive health information. The exclusion of SSS 3 students, necessitated by concurrent external examinations at the time of data collection, may have introduced selection bias, as this older subgroup might have contributed meaningfully to the knowledge and attitude profiles, given their greater cumulative exposure to information.

Finally, this study was carried out before the recent introduction of the HPV vaccine into the National Programme on Immunisation for young school girls by the Federal Government of Nigeria, and hence further studies to assess the impact of this recent addition will be necessary.

CONCLUSION

Our study demonstrated a poor knowledge of HPV/cervical cancer and a poor uptake of the HPV vaccine among respondents. Health education programs and vaccine campaigns geared toward creating and sustaining awareness among secondary school students and their parents in Delta State and other Nigerian states are highly recommended. Also, the government at all levels should make frantic efforts to sustain the HPV vaccine in the National Immunisation schedule. Further studies to assess the impact of this recent development will help direct advocacy and programs in cervical cancer elimination in the near future.

ACKNOWLEDGEMENTS

Authors would like to thank the State Ministry of Education and all the parents who allowed their wards to participate in this study and all the students who accepted participation in this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Onwusulu DN, Ilikannu SO, Ochuba CO, Idama V, Egboduku E, Fagbemi AJ, et al. Age and pattern of cervical smear cytology in Federal Medical Centre Asaba – a five year review. Adv Med Pharm Dent Res J. 2025;5(1):33-7.
2. Ubajaka C, Ukegbu A, Ilikannu S, Ibeh C, Onyeonoro U, Ezeanyim A. Knowledge of cervical cancer and practice of pap smear testing among secondary school teachers in

Nnewi North Local Government Area of Anambra State, South Eastern Nigeria. Adv Sex Med. 2015;5(2):13-21.
3. Ilikannu SO, Uzoka CP, Oyewumi ZO, Jombo SE, Okoye NP, Maduka NR, et al. Awareness and uptake of cervical cancer screening services among female nurses in a low-resource setting: A cross-sectional study. Int J Reprod Contracept Obstet Gynaecol. 2026;15(2):490-7.
4. Arbyn M, Weiderpass E, Bruni L, de Sanjose S, Saraiya M, Ferlay J, et al. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. Lancet Glob Health. 2020;8(2):e191-203.
5. World Health Organization. WHO updates recommendations on HPV vaccination schedule. 2022. Available at: https://www.who.int/news /item/20-12-2022WHO-updates-recommendations-on-HPV-vaccination-schedule. Accessed on 09 March 2026.
6. Garcia LM, Holschneider CH. Premalignant and malignant disorders of the uterine cervix. In: Decherney AH, Nathan L, Laufer N, Roman AS, editors. Curr Diagn Treat Obstet Gynaecol. 2019;12:837-62.
7. Oluwole EO, Idowu OM, Adejimi AA, Balogun MR, Osanyin GE. Knowledge, attitude and uptake of human papillomavirus vaccination among female undergraduates in Lagos State, Nigeria. J Family Med Prim Care. 2019;8(11):3627-33.
8. Fehintola OF, Fehintola OA, Ogundele AO, Adegbenro AC, Olowooker AS, Afolabi TO. Predictors and acceptability of human papilloma virus vaccine uptake among senior secondary school students in Ile-Ife. Sanamed. 2019;14(4):153-61.
9. Ojimah C, Maduka O. Awareness and uptake of human papillomavirus vaccines among female undergraduates: implications for cervical cancer prevention in south-south Nigeria. Port Harcourt Med J. 2017;11:134-40.
10. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3):209-49.
11. Biyazin T, Yilma A, Yetwale A, Fenta B, Dagnaw Y. Knowledge and attitude about human papillomavirus vaccine among female high school students at Jimma town, Ethiopia. Hum Vaccin Immunother. 2022;18(1):2036522.
12. Isara AR, Osayi N. Knowledge of human papillomavirus and uptake of its vaccine among female undergraduate students of Ambrose Alli University, Ekpoma, Nigeria. J Community Med Prim Health Care. 2021;33(1):64-75.
13. Bruni L, Diaz M, Castellsagué X, Ferrer E, Bosch FX, de Sanjosé S. Cervical human papillomavirus prevalence in 5 continents: meta-analysis of 1 million women with normal cytological findings. J Infect Dis. 2010;202(12):1789-99.
14. World Health Organisation. Cervical cancer. 2025. Available at: https://www.who.int/news-room/fact-sheets/detail/cervical-cancer. Accessed on 09 March 2026.
15. Bolarinwa OA. Sample size estimation for health and social science researchers: the principles and considerations for different study designs. Niger Postgrad Med J. 2020;27:67-75.
16. Ojeleye OA, Adejumo PO. Knowledge and Acceptance of HPV Vaccination among Lagos Students. Afr J Midwifery Women's Health. 2019;13(2):1-9.
17. Varkey B. Principles of Clinical Ethics and Their Application to Practice. Med Princ Pract. 2021;30(1):17-28.
18. Ezeanochie M, Olasimbo P. Awareness and uptake of human papilloma virus vaccines among female secondary school students in Benin City, Nigeria. Afr Health Sci. 2020;20(1):45-50.
19. Ifediora CO, Azuike EC. Knowledge and attitudes about cervical cancer and its prevention among female secondary school students in Nigeria. Trop Med Int Health. 2018;23(7):714-23.
20. Ndikom CM, Oboh PI. Perception, acceptance and uptake of human papillomavirus vaccine among female adolescents in selected secondary schools in Ibadan, Nigeria. Afr J Biomed Res. 2017;20:237-44.
21. Jalani MFF, Rani MM, Isahak I, Mohd Aris MS, Roslan N. Knowledge, attitude and practice of human papillomavirus (HPV) vaccination among secondary school students in rural areas of Negeri Sembilan, Malaysia. Int J Collab Res Intern Med Public Health. 2016;8(6):420-34.
22. Kristina SU, Permitasare NAL. Knowledge, attitude and barriers towards human papillomavirus (HPV) vaccination in developing economies of the South-East Asia Region: A systematic review. Syst Rev Pharm. 2019;10(2):81-6.
23. Nhumba N, Sunguya B. Low uptake of the second dose of human papillomavirus vaccine in Dar es Salaam, Tanzania. Vaccines. 2022;10(11):1919.
24. Nabirye J, Okwi LA, Nuwematsiko R, Kiwanuka G, Muneza F, Kamya C, et al. Health system factors influencing uptake of human papilloma virus (HPV) vaccine among adolescent girls 9-15 years in Mbale District, Uganda. BMC Public Health. 2020;20(1):171.
25. Perlman S, Wamai RG, Bain PA, Welty T, Welty E. Knowledge and awareness of HPV vaccine and acceptability to vaccinate in Sub-Saharan Africa: A systematic review. PLoS One. 2014;9(3):e90912.
26. Guodong L, Lan K, Ping D. HPV vaccine completion and dose adherence among commercially insured females aged 9 through 26 years in the US. Papillomavirus Res. 2016;2:1-8.

Cite this article as: Ilikannu SO, Onomuighokpo HO, Uzoma CG, Onunkwo MN, Ilikannu CO, Dan-Nwankwo C, et al. Uptake of human papillomavirus vaccine among private and public female secondary school students in Asaba, Delta State, Nigeria: a comparative cross-sectional study. Int J Reprod Contracept Obstet Gynecol 2026;15:2320-31.