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Original Article

Knowledge, Perceptions, Vaccine Uptake, and Reported Barriers to Human Papillomavirus (HPV) Vaccination Among Caregivers and Adolescent Girls in the Southern Senatorial District of Akwa Ibom State, Nigeria

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ABSTRACT

Background: Human papillomavirus (HPV) remains a significant public health challenge in Nigeria, where cervical cancer ranks as the second most frequent cancer among women. Vaccination is a proven preventive strategy, yet uptake remains suboptimal. This study examined the knowledge, perceptions, vaccine uptake, and reported barriers to HPV vaccination among caregivers and adolescent girls in the Southern Senatorial District of Akwa Ibom State, Nigeria.

Materials and Methods: A descriptive cross-sectional survey was conducted among 500 respondents (250 caregivers and 250 adolescent girls) selected through multi-stage random sampling. A structured, validated questionnaire was administered. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23, and chi-square tests were used for hypothesis testing at the 95% confidence level.

Results: Knowledge of HPV was low: 44.0% of caregivers and 26.0% of adolescent girls had heard of HPV, and only 25.2% of caregivers and 8.0% of adolescent girls demonstrated high knowledge. Among those aware of HPV, 22.7% of caregivers and 35.4% of adolescent girls had received the vaccine. No statistically significant associations were found between knowledge, perception, or demographic variables and vaccine uptake (all $p > 0.05$). Key barriers among caregivers included high cost (58.2%), unavailability (66.4%), safety concerns (35.5%), and need for more information (80.9%), which applied multiple responses.

Conclusion: Knowledge of HPV and its vaccine is broadly poor among both caregivers and adolescent girls in the study area, and vaccine uptake remains low despite generally positive perceptions where awareness existed. Integration of the HPV vaccine into the national immunization programme, community sensitization, and improved healthcare provider communication are urgently recommended.

Keywords: HPV Vaccine, Knowledge, Perception, Caregivers, Adolescent Girls, Akwa Ibom State, Nigeria

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INTRODUCTION

Human papillomavirus (HPV) is among the most prevalent sexually transmitted infections globally, encompassing over 100 serotypes, of which more than 40 infect the male and female genitalia. High-risk serotypes, particularly HPV types 16 and 18, are responsible for approximately 66.9% of cervical cancer occurrences in Nigeria [1]. Globally, the World Health Organization documented 604,000 new cervical cancer cases and 342,000 associated deaths in 2020, underscoring its status as a major public health concern [2]. In sub-Saharan Africa, cervical cancer is the leading cause of cancer-related death among women, with 34.8 new cases per 100,000 women and a mortality rate of 22.5 per 100,000 women recorded in 2018 [2].

In Nigeria, cervical cancer ranks as the second most frequent cancer among women and the fourth most common cause of cancer death in women aged 15–44 years [3]. The at-risk population of adolescent females aged 10 years and above is projected at approximately 53.1 million [1]. Despite the existence of safe, effective and licensed HPV vaccines since 2006, national uptake remains critically low. Nigeria is yet to fully integrate the HPV vaccine into its routine immunization programme, and structural barriers including high vaccine costs, limited availability, and poor community awareness continue to undermine vaccination efforts.

HPV vaccination is the primary preventive strategy against HPV-related infections and cancers. Vaccines such as Gardasil and Cervarix protect against HPV types 16 and 18, which account for over 70% of cervical cancers, and are ideally administered at ages 9–12 years, before sexual debut [4]. The HPV vaccine is administered according to a dose schedule determined by the age at which vaccination is commenced and the individual's immune status. According to the Advisory Committee on Immunization Practices (ACIP), individuals who receive their first dose before the age of 15 years are generally recommended to receive two doses, with an interval of 6–12 months between doses. However, individuals who initiate vaccination at age 15 years or older, as well as those with immunocompromising conditions, are recommended to receive a three-dose schedule at 0, 1–2, and 6 months [4]. Research across sub-Saharan Africa consistently reveals poor knowledge about HPV, its transmission and available vaccines. Kisaakye et al. in Uganda found that 57.1% of female adolescents had heard of HPV [5], whereas an Ethiopian study reported an overall knowledge score of only 11.4% among schoolgirls [6], and 88.2% of respondents in Ibadan, Nigeria, had never heard of HPV [7]. Among caregivers, only 39.1% of those with daughters aged 9–14 years in central Ethiopia were knowledgeable about HPV and its vaccine [8], and most caregivers in Northwest Cameroon and Jeddah lacked adequate knowledge [9, 10], although 71.8% of caregivers in Botswana had good knowledge [11].

Perception of the HPV vaccine encompasses beliefs about susceptibility to infection, severity of disease, perceived benefits and barriers, and trust in vaccine safety, constructs described in the Health Belief Model [12, 13]. Studies in Ethiopia and Lagos found that most respondents held positive attitudes towards the vaccine [14, 15]; however, 59.8% of caregivers in central Ethiopia held negative opinions, with 48.9% incorrectly believing it causes infertility [8], and concerns about promoting promiscuity were identified in Nigerian studies [7, 16]. Vaccine uptake, defined as to receive a recommended vaccine, and studies across Africa show low uptake, 54.8% of respondents in Lagos were willing to be vaccinated but only 2.6% had received the vaccine [15], while uptake was 16% in Ethiopia [17] and 17.6% in Uganda [5]. Barriers affecting willingness to vaccinate include cost [16, 18, 19], availability, safety concerns [9, 10], the role of healthcare providers [20], and inadequate information.

The Southern Senatorial District of Akwa Ibom State represents a geographically and socially distinct population where HPV vaccination coverage data remain sparse. Therefore, this study aimed to assess the level of knowledge of HPV and its vaccine among caregivers and adolescent girls, their perceptions towards the HPV vaccine, the uptake of the vaccine, and reported barriers of caregivers to vaccinate their adolescent daughters.

MATERIALS AND METHODS

Research Design and Setting

A descriptive cross-sectional survey design was employed. The study was conducted in the Southern Senatorial District of Akwa Ibom State, Nigeria, a geopolitical zone comprising several local government areas with a mixed urban-rural population, between May and June, 2023.

Study Population

The target population comprised caregivers of adolescent girls and adolescent girls aged 9-15 years residing in the Southern Senatorial District.

Sample Size

The sample size was determined using Cochran's formula

That is; $n_o = \frac{Z^2pq}{e^2}$

Where n_o = desired sample size

z = standard normal variate of the confidence level (95% = 1.96)

p = prevalence rate of 83% - 0.83 (the proportion of daughters who had not been vaccinated from previous study by Lakneh *et al*, 2022)

q = 1- p (1- 0.83 = 0.17)

d = margin of error = 5% (0.05) (at confidence level of 95%)

Therefore, $n_o = \frac{(1.96^2 \times 0.83 \times 0.17)}{(0.05^2)} = 217$

The sample size was doubled as both caregivers and adolescent girls were participants of the study. Hence, the sample size is 434.

Considering a 10% non-response rate = $\frac{\text{calculated sample size}}{1 - \text{non-response rate}}$

$$= \frac{434}{1 - 0.10} = 482$$

A sample size of 500 was used for the study.

Sampling Technique

A multi-stage random sampling procedure was adopted to select 500 respondents: 250 caregivers and 250 adolescent girls. In the first stage, five out of the 12 local government areas were selected using simple random sampling. In the second stage, two wards were randomly selected from each local government area, giving a total of 10 wards. In the third stage, five streets were randomly selected from each ward, resulting in 50 streets. In the fourth stage, systematic sampling was used to select five households per street, making a total of 250 households. Finally, one caregiver and one adolescent girl aged 9–15 years were selected from each household using the ballot method where necessary. Households without eligible respondents were replaced by the next house. Thus, the study targeted 250 households and up to 500 respondents. Household replacement may have introduced selection bias if the replacement households differed systematically from the originally selected households.

Data Collection Instrument

Data were collected using a structured, self-administered questionnaire divided into four sections. Section A assessed knowledge of HPV and its vaccine (disease aetiology, transmission, risk factors, vaccine type, dosage, and recommended age); Section B assessed perceptions using a four-point Likert scale (strongly agree to strongly disagree); Section C assessed vaccine uptake and prior vaccination history; and Section D assessed reported barriers to vaccinate. The instrument was validated by supervisors and public health professionals, and reliability was assessed with a Cronbach's alpha coefficient of 0.76.

Data Analysis and Presentation

Data were analyzed using IBM SPSS Statistics version 23. Descriptive statistics (frequencies and percentages) were used to summarize responses. Knowledge was categorized as high (score ≥70%) or low (score <70%). Vaccine uptake was assessed as receipt of the HPV vaccine among respondents who had heard of HPV. Bivariate associations were assessed using the chi-square test, with statistical significance set at $p \leq 0.05$ and a 95% confidence interval. Results were presented in tables.

RESULTS

Socio-demographic Characteristics of Respondents

A total of 500 respondents participated in the study, comprising 250 caregivers and 250 adolescent girls. The result in Table 1 shows that relatives were the main caregivers 86 (34.4%) of adolescent girls. 107 caregivers (42.8%) were married, about 35.2% were of Orthodox religion. Additionally, majority of caregivers 138 (55.2) had completed their tertiary level of education, whereas, a good number 86 (34.4%) of caregivers were self-employed.

Table 1: Socio-demographic Characteristics of Caregivers (N = 250)

Variable	Frequency (n)	Percentage (%)
Relationship to adolescent		
Father	81	32.4
Mother	83	33.2
Relative	86	34.4
Marital status		
Single	89	35.6
Married	107	42.8
Separated	40	16.0
Widowed	14	5.6
Religion		
Protestant	53	21.2
Orthodox	88	35.2
Catholic	82	32.8
Islam	10	4.0
African traditional religion	16	6.4
Other	1	0.4
Educational level		
No formal education	20	8.0
Primary	21	8.4
Secondary	71	28.4
Tertiary	138	55.2
Occupation		
Civil servant	71	28.4
Farmer	35	14.0
Trader	39	15.6
Self-employed	86	34.4
Unemployed	11	4.4
Other	8	3.2

The result in Table 2 shows that the mean age of adolescent girls was 11.9±2.051years. The frequently reported religion was Orthodox 98 (39.2). Also, majority 149 (59.6) of adolescent girls attended private schools and 161 (64.4%) adolescent girls were in Junior Secondary School (JSS) class.

Table 2: Socio-demographic Characteristics of Adolescent Girls (N = 250)

Variable	Frequency (n)	Percentage (%)
Age (years)		
9	42	16.8
10	32	12.8
11	41	16.4
12	38	15.2
13	30	12.0
14	26	10.4
15	41	16.4
Religion		
Protestant	53	21.2
Orthodox	98	39.2
Catholic	61	24.4
Islam	24	9.6
African traditional religion	14	5.6
School type		
Public	101	40.4
Private	149	59.6
Class level		
Junior Secondary School (JSS)	161	64.4
Senior Secondary School (SSS)	89	35.6

Awareness and Knowledge of HPV and Its Vaccine

Only 110 (44.0%) caregivers and 65 (26.0%) adolescent girls had heard of HPV. The main sources of information were the internet (28.2%) and healthcare providers (26.4%) among caregivers, and school (24.6%), caregivers (23.1%) and healthcare providers (20.0%) among adolescent girls, as shown in Table 3.

Table 3: Awareness of HPV and Sources of Information Among Respondents (N=500)

Characteristic	Caregivers (N = 250) n (%)	Adolescent girls (N = 250) n (%)
Awareness of HPV		
Had heard of HPV	110 (44.0)	65 (26.0)
Sources of information among those who had heard of HPV		
Internet	31 (28.2)	—
Healthcare providers	29 (26.4)	13 (20.0)
Radio/TV	22 (20.0)	—
School	3 (2.7)	16 (24.6)
Caregivers	—	15 (23.1)

Note: Percentages for sources of information are calculated among respondents who had heard of HPV (caregivers, n = 110; adolescent girls, n = 65). Respondents could report multiple sources of information; therefore, percentages for sources of information may not sum to 100%.

Knowledge of HPV was generally poor among both groups. Of the 110 caregivers who had heard of HPV, 63 (25.2%) of all caregivers demonstrated high knowledge (≥70%), while 47 (18.8%) had low knowledge. Among adolescent girls, 20 (8.0%) showed high knowledge and 45 (18.0%) had low knowledge. The majority of both groups had low overall knowledge of HPV and its vaccine, as shown in Table 4.

Table 4: Knowledge Levels Regarding HPV Vaccine Among Caregivers and Adolescent Girls (N=500)

Knowledge Level	Caregivers n (%)	Adolescent Girls n (%)
High knowledge (≥70%)	63 (25.2%)	20 (8.0%)
Low knowledge (<70%)	47 (18.8%)	45 (18.0%)
Never heard of HPV	140 (56.0%)	185 (74.0%)
Total	250 (100%)	250 (100%)

Perceptions Towards the HPV Vaccine

Among the 110 caregivers who had heard of HPV, 61 (55.5%) agreed they were likely to contract HPV infection and 77 (70.0%) agreed that HPV infection can lead to cervical cancer, recognizing it as life-threatening. While 68 (61.8%) agreed the vaccine could prevent cervical cancer, 59 (53.6%) worried that vaccination would encourage their daughters towards sexual activity and 64 (58.2%) believed their daughters were too young to be vaccinated (Table 5).

Table 5: Perceptions of Caregivers Towards the HPV Vaccine (N=110)

Perception Statement	Agree n (%)	Disagree n (%)
Likely to get HPV infection	61 (55.5%)	49 (44.5%)
HPV can lead to cervical cancer	77 (70.0%)	33 (30.0%)
Cervical cancer is life-threatening	77 (70.0%)	33 (30.0%)
HPV vaccine can prevent cervical cancer	68 (61.8%)	42 (38.2%)
Vaccine will encourage sexual activity	59 (53.6%)	51 (46.4%)
Daughter is too young to be vaccinated	64 (58.2%)	46 (41.8%)

Among the 65 adolescent girls who had heard of HPV, 41 (63.1%) agreed they were likely to contract HPV once sexually active and 40 (61.5%) recognized that non-consensual sex increased their risk. A majority, 45 (69.2%), agreed the vaccine would prevent HPV disease and 43 (66.2%) suggested it should be included in the government's free immunization programme. Nevertheless, 33 (50.8%) expressed fear of side effects, as shown in Table 6.

Table 6: Perceptions of Adolescent Girls Towards the HPV Vaccine (N=65)

Perception Statement	Agree n (%)	Disagree, n (%)
Likely to contract HPV once sexually active	41 (63.1%)	24 (36.9%)
Non-consensual sex increases the risk of HPV	40 (61.5%)	25 (38.5%)
Vaccine would prevent HPV disease	45 (69.2%)	20 (30.8%)
Vaccine should be in the free government immunization programme	43 (66.2%)	22 (33.8%)
Fear of side effects	33 (50.8%)	32 (49.2%)

Uptake of the HPV Vaccine

Among the 110 caregivers who had heard of human papillomavirus (HPV), 25 (22.7%) reported having received the HPV vaccine, while 85 (77.3%) had not received it. Similarly, among the 65 adolescent girls who had heard of HPV, 23 (35.4%) reported having received the vaccine, whereas 42 (64.6%) had not, as shown in the Figure.

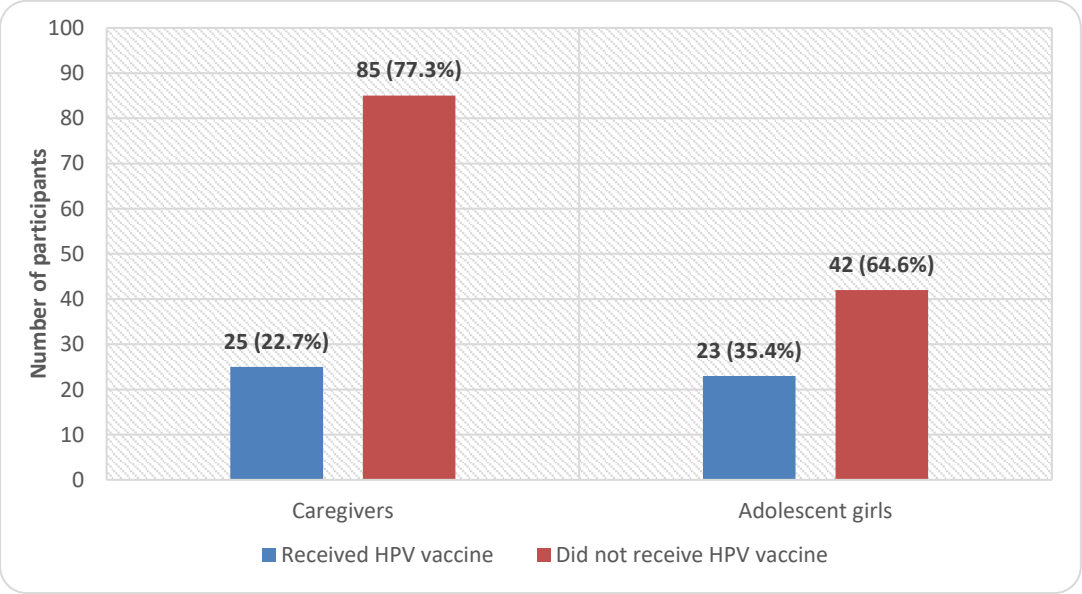


Figure: HPV Vaccine Uptake Among Caregivers and Adolescent Girls

Reported Barriers to Vaccinate

Among the 110 caregivers who had heard of HPV, 39 (35.5%) considered the vaccine unsafe or associated with harmful side effects. A majority, 64 (58.2%), reported that it was too expensive and 73 (66.4%) stated it was not available in their locality. Importantly, 89 (80.9%) indicated they required further information about the vaccine before considering vaccination for their daughters (Table 7).

Table 7: Reported Barriers to HPV Vaccination Among Caregivers Who Had Heard of HPV (N = 110)

Factor	n (%)
HPV vaccine is unsafe / has side effects	39 (35.5%)
HPV vaccine is too expensive	64 (58.2%)
Vaccine not available in location	73 (66.4%)
Require more information about vaccine	89 (80.9%)

Note: *Percentages are calculated using the 110 caregivers who had heard of HPV. Respondents could report more than one barrier; therefore, the percentages may not sum to 100%.*

Hypothesis Testing

Associations between selected sociodemographic characteristics, knowledge level, perceptions of HPV and its vaccine and HPV vaccine uptake were assessed using the chi-square test of independence. Results were considered statistically significant at $p < 0.05$. All three null hypotheses (Ho1, Ho2 and Ho3) were therefore not rejected as shown in Table 8.

Table 8: *Bivariate Analysis of Factors Associated with the HPV Vaccine Uptake (N=110)*

Variable	χ^2 value	(df)	p-value
Parent/caregiver relationship	0.393	2	0.822
Marital status	4.448	3	0.217
Religion	4.465	4	0.347
Level of education	1.780	3	0.619
Occupation	1.762	5	0.881
Knowledge level	0.098	1	0.754
Perceived likelihood of HPV infection	0.956	1	0.328
Belief that HPV infection can lead to cervical cancer	1.541	1	0.215
Belief that cervical cancer is life-threatening	0.555	1	0.456
Belief that the HPV vaccine can effectively prevent cervical cancer	1.421	1	0.233

DISCUSSION

The findings indicate that knowledge of HPV and its vaccine is substantially low among both caregivers and adolescent girls in the Southern Senatorial District of Akwa Ibom State. Only 44.0% of caregivers had heard of HPV, with 25.2% attaining high knowledge scores, while among adolescent girls only 26.0% had heard of HPV and 8.0% demonstrated high knowledge. These findings mirror those of Humnesa et al. in central Ethiopia, where only 39.1% of caregivers were knowledgeable [8], and of Beyen et al., where only 11.4% of adolescent girls had a good knowledge score [6]. Similarly, Ndikom and Oboh found that 88.2% of adolescent girls in Ibadan had never heard of HPV [7], closely paralleling the 74.0% unawareness recorded in the current study.

In contrast, Ukumo et al. in southern Ethiopia recorded a higher knowledge rate of 75.2% among primary school girls [21], and Senatla & Dolamo found 71.8% parental knowledge in Botswana [11]. These disparities likely reflect differences in the effectiveness of national health communication strategies, the availability of school-based health education, and the extent of healthcare provider engagement. The predominantly internet-based knowledge acquisition among caregivers (28.2%) and school-based sources among adolescents (24.6%) suggest that targeted digital and institutional health communication could meaningfully improve knowledge levels.

Among those aware of HPV, perceptions were moderately positive, consistent with the Health Belief Model constructs of perceived susceptibility, severity and benefits [12, 13]. The finding that 70.0% of caregivers agreed that HPV infection can lead to cervical cancer aligns with Senatla & Dolamo's finding that 69% of caregivers recognized the vaccine as effective in preventing cervical cancer [11], and with a Greek study in which 77% associated the vaccine with cervical cancer prevention [22].

However, 53.6% of caregivers were concerned that vaccination would encourage sexual behaviour among their daughters, a perception that remains prevalent in Nigerian literature [16]. This contrasts with a Malaysian study in which most caregivers (67.5%) believed the vaccine would not promote risky behaviour [23]. Additionally, 58.2% of caregivers believed their daughters were too young for vaccination, a misconception given that vaccination is recommended from age 9 years and is most effective before sexual debut [4]. The absence of significant associations between perceptions and vaccine uptake (all $p > 0.05$) suggests that attitude change alone is insufficient to drive uptake without concurrent structural interventions. Vaccine uptake among those aware of HPV was modest: 22.7% for caregivers and 35.4% for adolescent girls. Although higher than the 2.6% uptake recorded in Lagos [15], these figures remain far short of the WHO target of 90% coverage of girls by 15 years of age by 2030 [2].

The absence of statistically significant associations between knowledge, perception, demographic variables and uptake reinforces the view that structural determinants, particularly cost, availability and access to information, are more proximal drivers of vaccination behaviour than attitudes alone. This is consistent with the intention–behaviour gap described in behavioural research, where positive knowledge and attitudes fail to translate into health action without enabling conditions.

Four dominant barriers were identified: high vaccine cost (58.2%), unavailability (66.4%), safety concerns (35.5%) and insufficient information (80.9%). The finding on cost corroborates studies in Abakaliki and Lagos, where high cost was a primary deterrent to uptake [18, 19]. At an estimated minimum cost of ₦45,000 for a complete three-dose regimen, exceeding the monthly minimum wage of many Nigerians, the vaccine is financially inaccessible to a significant proportion of the population. The 66.4% rate of reported non-availability reflects supply chain deficiencies and the absence of the HPV vaccine from the national routine immunization schedule at the time of the study, in line with Nabirye et al. in Uganda, who identified unreliable vaccine supply as a critical barrier [24]. The high demand for more information (80.9%) underscores the need for healthcare provider-led education and community outreach, consistent with earlier recommendations [10, 20]. Safety concerns, though held by 35.5% of caregivers, are broadly consistent with findings in Cameroon [9], suggesting persistent misinformation that must be addressed through evidence-based communication.

STRENGTHS AND LIMITATIONS

A major strength of this study is the inclusion of caregiver–adolescent girl pairs, which enabled the assessment of HPV-related knowledge, perceptions, and vaccine uptake from the perspectives of both groups. The study also examined multiple sociodemographic characteristics and knowledge-

related factors in relation to HPV vaccine uptake, providing useful insights into potential barriers to vaccine acceptance in the study population. Furthermore, the use of a structured questionnaire and a defined sampling procedure supported systematic data collection.

However, several limitations should be acknowledged. This study is cross-sectional and therefore does not allow causal inferences. The sample was restricted to one senatorial district of Akwa Ibom State, limiting generalizability. Knowledge and uptake data on vaccination status relied on self-reporting, which may be subject to recall and social desirability biases. In the absence of verification using vaccination cards or medical records, the reported vaccination status and schedule completion may not accurately reflect actual vaccine receipt. Selection bias may have arisen from the recruitment of eligible caregiver–adolescent girl pairs and the replacement of households without eligible participants. If the recruited households differed systematically from those not included, the findings may not fully represent the wider target population. Also, given the low proportion of respondents with prior HPV knowledge, statistical power for detecting associations was constrained.

CONCLUSION

The findings of this study demonstrate that knowledge of HPV and its vaccine is broadly poor among caregivers and adolescent girls in the Southern Senatorial District of Akwa Ibom State, Nigeria. Vaccine uptake remains low, even among those with awareness, and structural barriers, particularly high cost, poor availability and inadequate health education, are the dominant impediments to uptake. While perceptions among those with existing knowledge are moderately positive, they do not translate into vaccination without enabling structural conditions.

The study makes the following recommendations: The Federal Government of Nigeria should urgently integrate HPV vaccination into the National Programme on Immunization to reduce cost and improve access. State and local health authorities should strengthen vaccine supply chains and ensure consistent availability at primary healthcare centres. Robust health education campaigns targeting caregivers and adolescent girls should be delivered through schools, faith-based organizations, healthcare facilities and mass media. Healthcare providers should be equipped and incentivized to routinely recommend and administer HPV vaccination, and community-specific behaviour change communication addressing safety misconceptions and sociocultural concerns should be implemented. Future longitudinal and qualitative studies should explore the determinants of the persistent intention–behaviour gap in HPV vaccination across Nigerian states.

DECLARATIONS

Ethical Approval: Ethical clearance was obtained from the appropriate institutional review board. Before carrying out the research, a letter of introduction was obtained from the Department of Public Health and ethical approval (HREC No. AKHREC/22/04/2023/184) gotten from the Akwa Ibom State Research Ethics Committee, Ministry of Health Headquarters, Akwa Ibom state.

Informed Consent: Informed consent was secured from all adult participants and from caregivers of young adolescent girls. Participation was voluntary and responses were treated with strict confidentiality.

Consent for Publication: Not applicable.

Conflict of Interest: The authors declare no conflict of interest.

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Authors' Contributions: Conceptualization, investigation, formal analysis, and writing original draft: SO. Supervision and validation: NCO. Methodology: UO. Review and editing: All authors.

Data Availability: The datasets generated and analyzed during this study are not publicly available due to ethical and confidentiality restrictions. However, they may be obtained from the corresponding author upon reasonable request, subject to approval by the relevant ethics committee.

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