Article

Willingness To Pay for HPV Vaccine Among Women Living With HIV in Nigeria

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Abstract: Background: Human papillomavirus (HPV) is responsible for most cervical cancer cases globally, with women living with HIV at higher risk of persistent HPV infection and HPV-associated disease. The HPV vaccine is a promising solution to reducing cervical cancer rates, but its uptake among women living with HIV in Nigeria is unknown. **Methods:** A facility-based, cross-sectional survey was conducted with 1,371 women living with HIV to assess their knowledge of HPV, cervical cancer, and the HPV vaccine, as well as their willingness to pay for the vaccine at the HIV treatment clinic, Nigerian Institute of Medical Research, Lagos. Multivariable logistic regression models were developed to identify factors associated with willingness to pay for the HPV vaccine. **Results:** The study found that 79.1% of participants had not heard of the vaccine, and only 29.0% knew of its efficacy in preventing cervical cancer. Moreover, 68.3% of participants were unwilling to pay for the vaccine, and the average amount they were willing to pay was low. Knowledge of HPV, the HPV vaccine, cervical cancer, and income were factors associated with willingness to pay for the vaccine. Health workers were the primary source of information. **Conclusion:** The study found that 79.1% of participants had not heard of the vaccine, and only 29.0% knew of its efficacy in preventing cervical cancer. Moreover, 68.3% of participants were unwilling to pay for the vaccine, and the average amount they were willing to pay was low. Knowledge of HPV, the HPV vaccine, cervical cancer, and income were factors associated with willingness to pay for the vaccine. Health workers were the primary source of information.

Keywords: HPV; Cervical cancer; HPV vaccine; Women; HIV

1. Background

Cervical cancer is a major public health issue globally with over 600,000 new cases and 300,000 deaths in 2020 (1, 2). Over 80% of incidence and mortality are in low-and middle-income countries (LMICs) with the highest mortality in sub-Saharan Africa (2, 3). The incidence rate of cervical cancer in Nigeria is 250/100,000 women, an endemic level that remains an intractable challenge to public health, particularly among women living with HIV (WLWH) (4, 5). HIV-positive women have been shown to have consistently higher incidence and mortality rates of cervical cancer compared to their HIV-negative counterparts (4). Cervical cancer and HIV have been reported to be closely intertwined, and the number of patients with comorbidities continues to grow rapidly. HPV is sexually transmitted, and most people become infected sometime during their lifetime, usually soon after becoming sexually active (1, 6). HPV 16 and HPV 18 are responsible for 70% of cervical cancer and most non-cervical HPV-associated cancers. While HPV infection is the most important risk factor for cervical cancer, other predisposing factors include early age

of sexual activities, early marriage (below 20 years of age), multiple sexual partners, unprotected sex, long-term use of hormonal contraceptives, increased number of pregnancies, smoking, and unhygienic practices (2, 7).

According to the World Health Organization (WHO), vaccinating girls aged 9-14 against HPV can prevent at least one-third of all HPV-related cancers in Africa (8, 9). Many high-income countries have now included HPV vaccination for adolescent girls as part of their routine immunization schedule (10, 11). In Sub-Saharan Africa, five countries with the highest rates of cervical cancer deaths emphasize the need for increased uptake of HPV vaccination in the region (8). Therefore, countries need to implement effective, affordable, and sustainable HPV delivery strategies compatible with their health systems to achieve maximum coverage. Since 2012, numerous global and national programs have introduced pilot programs to determine the best strategies for optimizing HPV vaccine delivery in low- and middle-income countries (12, 13).

Despite the success of cervical cancer screening programs in developed countries, screening for cervical cancer remains unpopular in Nigeria (14-16). The country currently lacks an organized national screening program, and HPV screening is primarily opportunistic, with an estimated coverage rate of around 8.7% (15, 17). Nigeria has licensed two types of vaccines that prevent cervical cancer: GSK's bivalent HPV vaccine (Cervarix) and Merck & Co. Inc.'s quadrivalent HPV vaccine (Gardasil). These vaccines are highly effective in preventing persistent HPV infection and subsequent precancerous lesions caused by two types of HPV (types 16 and 18) that are responsible for about 70% of cervical cancer cases worldwide (15, 17-19).

Considering all-female populations is crucial in achieving the global goal of cervical cancer elimination. WLHIV are of particular importance, as they have higher rates of persistent HPV infection and HPV-associated disease. Furthermore, countries, such as Nigeria, with high rates of HIV also tend to have low rates of cervical cancer screening, making simple and affordable vaccine schedules critical (4). Studies have shown that the HPV vaccine is safe, immunogenic, and effective in WLHIV, with the best immune response observed in those with undetectable HIV viral loads.

Introducing HPV vaccines in developing countries has been a significant challenge due to high prices. The Vaccine Alliance (Gavi) and its partners aim to provide the poorest countries with access to a sustainable supply of new and underused vaccines, including HPV vaccines, for as little as US$4.50 per dose (2,072.25 Nigerian Naira) (18, 20). Gavi also offers support for HPV demonstration programs and the national introduction of HPV vaccines, depending on a country's demonstrated ability to deliver vaccines to young adolescent girls (15, 18). In Africa, Rwanda, Tanzania, South Africa, and Senegal are among those countries that have the HPV vaccine in their national programs for immunization following successful piloting projects (12, 21). Few other countries including Nigeria have pilot programs ongoing (1, 20, 22). Gavi's current vaccine support in Nigeria includes pentavalent, pneumococcal conjugate, yellow fever, meningitis A, and measles vaccines, as well as financial support for the health system and immunization system strengthening (15). Currently, HPV vaccines are purchased "out-of-pocket" and are not among the vaccines offered for free under the National Immunization Program (NIP) in Nigeria, as providing free HPV vaccination would further strain the government's tight health budget. In addition to the cost of the vaccine, HPV vaccination requires the development of a new vaccine delivery system to reach adolescent girls, as there is currently no existing structure to support the activity. Therefore, even with Gavi's support, substantial funding is required for the delivery of HPV vaccination to the community.

Studies have shown that obstacles to the uptake of the HPV vaccination include price, parents' willingness to pay for their daughter, and inadequate knowledge, specifically among parents of the target population and especially in lower-middle-income countries such as Nigeria, negative beliefs, and opposing attitudes (23, 24). In Nigeria, many studies that examined knowledge and parental acceptance of the HPV vaccine reported low levels of knowledge (Fagbule et al., 2020) and high levels of vaccine acceptability (Ugwu,

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Obi, Ezechukwu, Okafor, & Ugwu, 2013; Wilson, 2021). However, this study examined the willingness to pay for the HPV vaccine among WLHIV in Nigeria.

2.Materials and Methods

Study Design and Setting: *This study was a facility-based cross-sectional survey conducted at the HIV treatment clinic, Nigerian Institute of Medical Research (NIMR), Lagos state. NIMR is an apex medical research institution in Nigeria charged with the responsibility to conduct research into diseases of public health importance. The institute currently provides comprehensive HIV care, treatment, and support for over 20,000 patients of whom 62.9% are women.*

Study Population: The study population was women of known HIV status aged 18 years and above receiving treatment at the NIMR clinic, Lagos State. Women of known HIV status aged 18 years and above attending the NIMR clinic and eligible for cervical cancer screening. Women who are unable to provide informed consent were excluded from the study.

Sampling method and Sample size determination: The sampling method for this study was convenience sampling, a type of non-probability sampling technique. All eligible women who were willing to participate in the study and provided informed consent were included in the sample. The study sample size was calculated according to the following formula: $N = Z\alpha^2P\ (1\text{-}P)/d^2$ where $Z\alpha$ is the Z statistics for a 95% confidence level, N is the sample size, P is the prevalence of WLWH willing to pay for HPV vaccine, and d is the precision (Kish L. Survey Sampling. New York). The population proportion of WLWH in Nigeria who are willing to pay for the HPV vaccine is 50%, with a 95% confidence level and a 5% margin of error, the minimum required sample size calculated was approximately 385 participants. However, with an increase in the precision estimate and also accounting for potential non-response or missing data, the sample size was increased to 1371 participants using a margin of error of approximately 2.5% with a 95% confidence level.

Data Collection Tool: The questionnaire was pretested for reliability and validity through a pilot study with a small sample of participants before its administration in the main study. An interviewer-administered questionnaire was used to obtain information on participants' age, education level, current primary occupation, average monthly per capita income, and the current number of children. It also assessed the knowledge of HPV, cervical cancer, and HPV vaccines. Questions examining the causes of cervical cancer were used to assess the knowledge of the diseases and HPV vaccine (i.e. knowledge index score). In this study, the willingness to pay for the HPV vaccine was defined as the intention among unvaccinated women to receive the HPV vaccine after knowing its price. Vaccine rejection was measured based on the response to the following question: "If the vaccine is not free, and you have to pay 'out of pocket' by yourself, will you vaccinate yourself and/or your daughter against HPV"? The follow-up question was used to assess the WTP of "vaccine acceptors". The question read as follows: "If so, from the scale below mark '*x*' on the maximum amount you will pay (in Naira) to have yourself and/or your daughter vaccinated against HPV". Participants who answered "no" or indicated zero on the payment card were classified as "vaccine rejecters", while the ones who answered "yes" and indicated a positive value on the payment card was classified as "vaccine acceptors". Offered WTP values in the payment card ranged from zero to more than 27,623.40 Nigerian Naira (equivalent to US$60). The maximum price offered reflects the Nigerian market price for the vaccine. The maximum amount they were willing to pay was considered as their perceived monetary benefit of the vaccine. Responses to the WTP questions were grouped into two categories: vaccine acceptors and vaccine rejecters. The response to the WTP question was used as the dependent variable in multivariate logistic regression.

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Data Collection Procedure: The data collection was carried out between June 2022 and November 2022. It involved face-to-face interviews with eligible participants. All research assistants were trained before the commencement of the study essentially on the research tools, interviewing skills, data management, and clarifications on ethical issues in research. For participants who could neither read nor write, the research assistants administered the questionnaires in pidgin English/local language. The questionnaires were administered in a private setting and provided clarification and assistance where necessary. The interviews took approximately 20 minutes to complete.

Statistical analysis: The data collected from the survey were analyzed by SPSS version 27.0 (SPSS Inc. Chicago, IL) statistical packages. Descriptive statistics, including frequencies and percentages, were used to summarize the socio-demographic and health characteristics of the study participants. The mean and standard deviation were used to summarize continuous variables, such as age and income. The primary outcome variable was the willingness to pay for the HPV vaccine, which was measured as a binary variable (yes/no). We used logistic regression analysis to examine the factors associated with willingness to pay for the HPV vaccine. The independent variables included in the regression model were socio-demographic variables, HIV-related health status variables, and knowledge about HPV and the HPV vaccine. The odds ratio (OR) and 95% confidence interval (CI) were used to estimate the strength and direction of the association between the independent variables and the outcome variable. A p-value of less than 0.05 was considered statistically significant. We also conducted sensitivity analyses to assess the robustness of the findings to different assumptions and models. Subgroup analyses were conducted to examine the associations between the independent variables and willingness to pay for the HPV vaccine by age group, income level, and educational level.

Ethical Considerations: This study was conducted following the ethical principles of the Declaration of Helsinki. Ethics approval was obtained from the Institutional Review Board, Nigerian Institute of Medical Research, Lagos State (IRB-21-047). Informed consent was obtained from all participants before data collection. Before administering the questionnaire, participants were provided with information sheets outlining the objective and scope of the study which was duly explained to the participants in English language or the local dialect (Yoruba/Pidgin). The participants were informed that participation in the study was voluntary, and they were free to withdraw from the study at any point without any consequences. The confidentiality and anonymity of the participants were ensured, and all data collected were kept confidential and used only for research purposes. The participants were assured that participation or non-participation would not affect their access to healthcare services. In addition, participants who required psychological support after the study were referred to the appropriate healthcare professionals. The study investigators ensured that the research was conducted with the highest level of professionalism and adherence to ethical guidelines.

3. Results

Table 1 shows the socio-demographic characteristics of participants in this study. A total of 1371 participants participated in the study. The mean age of the participants was 43.2± 9.2. Most of the participants were married 809 (59%), and 668 (48.7%) had a tertiary level of education. 1008 (73.5%) of the participants were working. 587 (42.8%) of the participant's income level fell between 18,000.00 NGN (US$ 40.0) – 35,000.00 NGN (US$ 76.0).

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Table 1. Participant's socio-demographic characteristics (N=1371).

Socio-demographic	N (%)
Age (Mean ± SD)	43.2± 9.2
Age group	
≤30	117(8.5)
31-40	409 (29.8)
41-50	578(42.2)
51-60	225(16.5)
>60	41(3.0)
Ethnicity	
Igbo	545(39.8)
Yoruba	499(36.4)
Hausa	29(2.1)
Others	298(21.7)
Education level	
No Education	24(1.8)
Primary	120(8.8)
Secondary	559(40.8)
Tertiary	668(48.7)
Working status	
Not working	363(26.5)
working	1008(73.5)
Profession	
Unemployed	56(4.1)
Self-employed	1016(74.1)
Professional	240(17,5)
Civil servant	59(4.3)
Marital status	
Single	256(18.7)
Married	809(59)
Separated	85(6.2)
Divorced	20(1.5)
Widowed	201(14.7)
Income(N)	
<18000	358(26.1)
18000-35000	587(42.8)
36000-50000	165(12)
51000-70000	82(6)
71000-100000	77(5.6)
>100000	102(7.4)
Number of sexual partners	

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None	1099(80.2)
1	242(17.7)
<3	28(2.0)
>3	2(0.1)
Source of Income	
Family	329(24)
Wages	667(48.7)
Salary	375(27.4)

Table 2 shows the knowledge of the HPV vaccine among the study participant. 1085 (79.1%) indicated that they have not heard of the HPV vaccine. 1092 (78.6%) participants said if the vaccine exists, then it will cure cervical cancer. 447 (32.6%) of the study participants indicated that if the HPV vaccine has been taken, there is still a need for regular screening. 423 (30.9%) of the study participants agreed that the HPV vaccine is highly effective in preventing HPV infection. and 398 (29.0%) agreed that the HPV vaccine is highly effective in preventing cervical cancer.

Table 2. Knowledge of the HPV vaccine.

Knowledge/belief	**No N (%)**	**Yes N (%)**
Have you heard of the HPV vaccine?	1085(79.1)	86(20.9)
Does the HPV vaccine cure cancer?	279(20.4)	1092(79.6)
Is regular screening for cancer still needed even though you have been vaccinated with HPV?	924(67.4)	447(32.6)
Is the HPV vaccine highly effective in preventing HPV Infection?	948(69.1)	423(30.9)
Is the HPV vaccine highly effective in preventing cervical cancer?	973(71.0)	398(29.0)

Table 3 presents the attitude of women living with HIV in Lagos toward a willingness to pay for the HPV vaccine. 937 (68.3%) said they are not willing to pay for the HPV vaccine. When asked if they were willing to get their daughter vaccinated provided the HPV vaccine was available, 762 (55.6%) said they are willing to get their daughter vaccinated; however, when asked if they are willing to pay for their daughter's vaccine if required to pay for it, only 455 (33.2%) agreed to pay for their daughter's vaccine When asked if vaccination is free, would they allow all female around them to be vaccinated, 1085 (79.1%) confirmed that yes, if vaccination is free, all female around them would get vaccinated. Only 35 (2.6%) participants had been vaccinated with the HPV vaccine. The average amount the participants were willing to pay for the vaccine could afford if available was ₦3221.15 (7.00 USD) ± 3963.950 (8.61 USD).

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Table 3. Attitude/willingness toward HPV vaccine.

Attitude/Willingness	No N (%0	Yes N (%0
Are you willing to pay for the HPV vaccine?	937(68.3)	434(31.7)
Are you willing you get your daughter vaccinated?	609(44.4)	762(55.6)
Would you be willing to pay for your daughter's vaccine?	916(66.8)	455(33.2)
If vaccination is free would you allow all females around you to be vaccinated?	286(20.9)	1085(79.1)
Have you been vaccinated against HPV?	1336(97.4)	35(2.6)
Amount willing to pay (Mean ± SD)	3221.15± 3963.950	

Table 4 shows the results of assessing the association between individual factors and willingness to pay for the HPV vaccine. The analysis revealed that education level was significantly associated with willingness to pay, but only among participants who attended tertiary level education (OR = 4.564, 95% CI: 1.860 – 11.164). The study also indicates that participants earning between 51,000.00 NGN and 70,000.00 NGN (US$ 111 and US$ 152) and that earning above 100,000.00 NGN (> US$ 217) were willing to pay for the vaccine (OR = 2.178, 95% CI: 1.315-3.610) and (OR = 3.673, 95% CI: 2.209-6.108) respectively.

However, after controlling for potential confounders and inter-relationships between factors, it shows that participants who had attended tertiary education (aOR = 4.004; 95% CI: 1.623-9.877), and those that are earning greater than 100,000.00 NGN (US$ = 217) (aOR = 2.468; 95% CI: 1.458-4.180) were willing to pay for HPV vaccination. Furthermore, knowledge of HPV (aOR = 2.270, 95% CI: 1.400-3.681) and cervical cancer (aOR = 4.241, 95% CI: 3.035-5.925) were found to be statistically significant with the participants' willingness to get vaccinated. The knowledge of the HPV vaccine was found to be significant (OR = 1.983; 95% CI: 1.454-2.704) but was not statistically significant after controlling for other factors (aOR = 1.284; 95% CI: 0.914-1.804).

Table 4 Factors Associated with the Willingness to Pay for the Vaccine.

Variables	Category	Crude OR 95% CL (Lower-Upper)	P-VALUE	Adjusted OR 95% CI (Lower-Upper)	P value
Education Level	No education	Ref		Ref	
	Primary	1.308(0.502-3.404)	0.583	1.273(0.488-3.321)	0.621
	Secondary	2.386(0.974-5.842)	0.057	2.266(0.923-5.564)	0.074
	Tertiary	4.564(1.860-11.164)	0.001**	4.004(1.623-9.877)	0.003**
Income (NGN)	<18000	Ref		Ref	
	18000-35000	1.282(0.985-1.668)	0.065	1.183(0.904-1.549)	0.221
	36000-50000	1.283(0.886-1.858)	0.186	0.972(0.661-1.429)	0.884
	51000-70000	2.178(1.315-3.610)	0.003**	1.649(0.983-2.766)	0.058
	71000-100000	1.504(0.914-0.475)	0.109	1.047(0.625-1.755)	0.861
	>100000	3.673(2.209-6.108)	0.000**	2.468(1.458-4.180)	0.001**
Knowledge of HPV	Poor knowledge	Ref		Ref	
	Good Knowledge	3.899(2.489-6.108)	0.000**	2.270 (1.400 - 3.681)	0.001**
Knowledge of the HPV Vaccine	Poor knowledge	Ref		Ref	
	Good knowledge	1.983(1.454-2.704)	0.000**	1.284 (0.914-1.804)	0.149
Knowledge of cervical cancer	Poor knowledge	Ref		Ref	
	Good Knowledge	5.061(3.657-7.004)	0.000**	4.241 (3.035-5.925)	0.000**

** *Statistically significant*

Table 5 presents the results of assessing the association between perceived screening benefits and willingness to pay for the HPV vaccine. Each perceived benefit was found to have a strong statistical significance analyzed. However, after adjusting for other confounding factors, only participants with accurate knowledge of the HPV vaccine's effectiveness against the development of cervical cancer (aOR = 1.856, 95% CI: 1.231-2.798), the effectiveness of early detection of cervical cancer (aOR = 1.366, 95% CI: 1.049-1.779), the effectiveness of regular screening (aOR = 2.227, 95% CI: 1.609-3.082), and the knowledge that screening for cervical cancer in women with HIV can prevent the development of cancer (aOR = 2.009, 95% CI: 1.509-2.675) were statistically significant.

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Table 5. Health belief associated with the willingness to pay.

Variables.	Category	Crude OR 95%CL(Lower-Upper)	P-VALUE	Adjusted OR 95% CI(Lower-Upper)	P value
Perceived screening benefit					
Screening for cervical cancer in women with HIV can prevent the development of cancer	No	Ref		Ref	
	Yes	3.907(3.056-4.994)	0.000**	2.009(1.509-2.675)	0.000**
Is regular Screening for cervical cancer needed even though you have been vaccinated against HPV	No	Ref		Ref	
	Yes	4.991(3.832-6.502)	0.000**	2.227(1.609-3.082)	0.000**
Early detection of cervical cancer can increase the survival	No	Ref		Ref	
	Yes	2.422(1.946-3.016)	0.000**	1.366(1.049-1.779)	0.021**
Susceptibility to cervical cancer and HPV infection					
The germ that can cause cervical cancer can be transmitted through sexual intercourse	No	Ref		Ref	
	Yes	1.784(1.430-2.225)	0.000**	0.916(0.695-1.206)	0.530
HPV is transmitted during sexual intercourse	No	Ref		Ref	
	Yes	3.093(2.407-3.975)	0.000**	1.287(0.944-1.755)	0.111
Perceived benefit of the vaccine					
Are HPV vaccines highly effective for HPV infection	No	Ref		Ref	
	Yes	4.316(3.314-5.620)	0.000**	1.221(0.808-1.846)	0.343
Are HPV vaccines highly effective against cervical cancer	No	Ref		Ref	
	Yes	4.644(3.528-6.111)	0.000**	1.856(1.231-2.798)	0.003**

** *Statistically significant*

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4. Discussion

This study quantitatively investigated the willingness to pay for HPV vaccination among WLWH in Nigeria. Cervical cancer remains a significant public health concern in Nigeria. It is clear that HPV awareness is low, and specific knowledge was generally poor among WLWH in Nigeria.

The results of this study indicate that there is a significant lack of knowledge of HPV, cervical cancer, and HPV vaccine among the participants indicating a need for greater public awareness and education about these important health issues. This is similar to a study conducted among WLWH in Lagos, Nigeria where 67.7% of the participants had never heard of HPV infection, and only 22.3% knew about the HPV vaccine (25). Also, in a study conducted in the United States, it was found that HPV vaccine knowledge and awareness were low among WLWH despite their dramatically increased risk of developing pre-cancerous cervical lesions and cervical cancer as well as other types of HPV-associated cancers (26, 27).

The source of information for both HPV and cervical cancer was primarily from health workers, indicating the need for healthcare providers to play a greater role in disseminating information about these health issues to the public. These findings are consistent with previous studies that have reported the important role of health workers in improving knowledge and awareness of HPV and cervical cancer (28, 29).

The study revealed that the majority of the participants were unwilling to pay for the HPV vaccine, indicating that the cost is a substantial barrier, particularly for those with lower incomes. Only 3% of the participants had already received the HPV vaccine. This is similar to a study conducted in Vietnam where none of the participants categorized as being from a poor/near-poor household was vaccinated against HPV (30). Diverse studies conducted in developing parts of the world have highlighted high costs as an obstacle to vaccine acceptance (31, 32), indicating that economic constraints keep women from taking advantage of this important health service even where it is available. Strategies to promote the HPV vaccine will need to pay particular attention to some key demographic trends such as education, and income. Although studies conducted on the willingness to pay for the HPV vaccine among Nigerian female undergraduates and the general population found that a higher percentage of participants were willing to pay for the HPV vaccine (33, 34) However, this contradicts the findings of this study where the majority of participants were unwilling to pay for the vaccine. It could be suggested that WLWH may have other healthcare needs that take precedence over getting the HPV vaccine, such as managing their HIV medications or addressing other HIV-related complications. where the majority were unwilling to pay for the vaccine.

This study also assessed WLWH's willingness to pay for HPV vaccination for their daughters and/or females in their community. The results showed that 55.6% of the participants were willing to vaccinate their daughters, while 66.8% were not willing to pay for the vaccine, indicating that cost was a significant factor in their decision-making. However, if the vaccine were provided for free, 79.1% of the participants expressed their willingness to vaccinate their daughters and other females in their community, suggesting potential demand for the vaccine. Another study found that 72% of parents were willing to vaccinate their daughters if the vaccine was offered for free (35). Studies conducted in other parts of the world have also shown that low-income individuals may be less willing to pay for the HPV vaccine due to financial constraints (10, 31, 36, 37). The findings suggest that cost is a significant barrier to vaccine uptake, particularly in low-income settings. However, parents who perceive the vaccine to be effective and necessary for their daughters are more willing to pay for it. Therefore, addressing the cost of the vaccine and educating parents on the benefits of HPV vaccination is crucial to improve vaccine uptake.

The study found that participants were willing to pay a meaningful amount of US$7.46 ± US$9.17 (3221.15 NGN ± 3963.95 NGN) which is significantly lower than the market cost. Therefore, reducing the cost of the vaccine could potentially increase willingness to pay and vaccine uptake, and a co-payment for HPV vaccination could be a viable

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option to augment the cost of vaccination in a government-funded vaccination scenario. This is consistent with previous studies conducted in Kenya and India, which also identified cost as a significant barrier to HPV vaccination uptake and suggested strategies to reduce costs such as government-sponsored programs and subsidies (38).

This study aimed to identify factors associated with the willingness to pay for the HPV vaccine. The results indicated that participants who had completed tertiary education were more likely to be willing to pay for the vaccine than those who had not. This suggests that higher education levels may be a contributing factor in determining an individual's willingness to pay for the HPV vaccine. Similarly, another study showed that knowledge of cervical cancer was significantly associated with willingness to pay, and participants with higher education were willing to pay for the vaccine at a lower price than those with less secondary education (39, 40). Other studies conducted in the United States, Canada, and Ethiopia also highlighted the significance of various factors affecting vaccine uptake and willingness to pay (41-44). These factors include knowledge about HPV and its associated diseases, perceived risk of HPV, perceived effectiveness of the vaccine, and awareness of cervical cancer. Overall, the findings emphasize the importance of addressing these factors to increase vaccination rates and reduce the burden of HPV-related diseases.

Additionally, a study conducted in Nigeria found that cost and lack of knowledge about cervical cancer and its prevention were significant barriers to vaccine uptake and willingness to pay (45). This finding supports the results of this study, which showed that knowledge of HPV and the vaccine were significant predictors of willingness to pay (45). Another study conducted in Nigeria also identified fear of side effects and lack of trust in the safety and efficacy of the vaccine as important factors contributing to low vaccine uptake and willingness to pay (25, 46, 47). While education level and income were not strongly associated with willingness to pay for the HPV vaccine, the study found that participants who had attended tertiary education were more willing to pay for the vaccine than those who had not. This is consistent with previous research suggesting that education level can influence health-related decision-making (48, 49).

According to this study, the perceived benefits of screening are significantly related to the willingness to pay for the HPV vaccine. The results indicate that individuals who have accurate knowledge about the vaccine's effectiveness in preventing cervical cancer, early detection of cervical cancer, the importance of regular screening, and the benefits of screening for cervical cancer in women with HIV are more willing to pay for the vaccine. These findings align with prior research that suggests the perceived benefits of preventive health measures can impact healthcare decision-making (50).

Furthermore, the study highlights that the knowledge of the HPV vaccine's effectiveness in preventing cervical cancer is the most significant factor related to the willingness to pay for the vaccine. This finding suggests that increasing public awareness about the vaccine's effectiveness in preventing cervical cancer could potentially increase vaccine uptake.

Overall, the findings of this study and similar studies conducted in other countries emphasize the importance of addressing knowledge gaps, increasing awareness about the benefits of the vaccine, and addressing cost barriers to improve vaccine uptake and willingness to pay. Targeted educational interventions and strategies to improve access and affordability of the vaccine could help increase vaccine uptake and ultimately reduce the burden of cervical cancer.

5. Conclusion

This study has revealed a lack of knowledge about HPV, cervical cancer, and the HPV vaccine among WLWH in Nigeria. The majority of participants were not willing to pay for the HPV vaccine, likely due to inadequate awareness and knowledge about it. Health workers were the primary source of information. Improving education and awareness about the vaccine's importance in preventing cervical cancer is crucial. The study also

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identified factors associated with willingness to pay, such as income, knowledge of HPV and the vaccine, awareness of cervical cancer, and the health belief model of perceived screening benefit. These findings could aid in the development of effective strategies to increase vaccine uptake in Nigeria. It is recommended that the Nigerian government and healthcare providers implement community outreach and school-based education programs to increase awareness and education about the HPV vaccine and cervical cancer prevention. Further research is necessary to explore additional factors that influence willingness to pay for the vaccine.

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