

Knowledge, Attitudes, And Practices on Cervical Cancer Screening and HPV Vaccination Among Women in Southeast Nigeria

The PENKUP Collaboration

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ABSTRACT

Background: Cervical cancer remains a major public health challenge in Nigeria. According to the latest GLOBOCAN 2022 estimates, there were 13,676 new cases and 7,093 deaths, making it the third most common cancer and a leading cause of cancer-related mortality among women in the country. Although Nigeria has adopted both national and global strategies supporting HPV vaccination and the elimination of cervical cancer by 2030, the uptake of Pap smear screening and other preventive services remains low. Assessing the knowledge, attitudes, and practices (KAP) of women regarding cervical cancer prevention is essential to identifying gaps in awareness, health communication, and service delivery. This study assessed the knowledge, attitudes, and practices regarding cervical cancer, Pap smear screening, and HPV vaccination among women aged 21–65 years in Nnewi-North LGA, Anambra State, Nigeria, and identified barriers to effective prevention and control.

Methods: A descriptive cross-sectional study was conducted among women attending primary health centres (PHCs) in Nnewi-North LGA. Using a multistage random sampling method, data were collected through a structured interviewer-

administered questionnaire assessing socio-demographic characteristics, knowledge, attitudes, and practices related to cervical cancer prevention. Data were analysed with SPSS version 25 using descriptive and inferential statistics at a significance level of $p < 0.05$.

Results: Of the 427 questionnaires distributed, 402 were completed (response rate = 94.1%). The majority of respondents were aged 21–40 years and 65.2% were married. Most (92%) had heard of cervical cancer, and 58.2% correctly identified HPV infection as its cause. Awareness of Pap smear was moderate (75.9%), but only 11.2% had ever been screened. Major barriers included lack of information on where to test (38.6%) and time constraints (25.4%). Awareness of HPV vaccination was high (86.3%), and 84.6% knew it prevents cervical cancer. Overall, 93.3% expressed willingness to undergo free screening and 96.8% would recommend it to others.

Conclusion: Despite high awareness and generally positive attitudes toward cervical cancer prevention, actual uptake of Pap smear screening and HPV vaccination remains low among women in Southeast Nigeria. Educational level emerged as a key determinant of awareness and attitudes, with women who had higher education significantly more likely to be knowledgeable about cervical cancer, Pap smear screening, and HPV vaccination, and more willing to recommend HPV vaccination. Persistent knowledge gaps, sociocultural beliefs, and limited access to services continue to constrain preventive practices. Strengthening community-based health education particularly targeting women with lower educational attainment, improving service accessibility, and integrating cervical cancer screening into routine primary healthcare are essential to reducing the cervical cancer burden.

Keywords: Cervical cancer prevention, HPV vaccination, Pap smear screening, Knowledge, Attitudes, Practices, Women's health, Primary healthcare services, Screening uptake, Health education, Nigeria, Barriers to care

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INTRODUCTION

Cervical cancer remains a major public health challenge in Nigeria. Latest data from GLOBOCAN 2022 estimate 13,676 new cases and 7,093 deaths, positioning it as the third most common cancer and a leading cause of female cancer mortality in Nigeria. Despite being largely preventable through human papillomavirus (HPV) vaccination, the burden remains high due to limited access to screening services and low awareness levels.^{1,2}

To address this, the Federal Ministry of Health (FMOH) in Nigeria, in collaboration with several partners launched the nationwide HPV vaccination campaign in October 2023. The campaign targeted 7.7 million girls aged 9–14 years and reached over 12 million by early 2025, marking it as one of the largest vaccination drives in sub-Saharan Africa. This effort aligns with the WHO's global strategy to eliminate cervical cancer, which aims to achieve 90% HPV vaccination coverage, 70%

screening coverage, and 90% access to treatment by 2030.²⁻⁴

However, the rollout of cervical screening services in Nigeria remains inconsistent. While vaccination efforts have gained momentum, screening coverage is still suboptimal, particularly at the primary healthcare (PHC) level. Many PHCs lack the infrastructure, personnel, and commodities needed to offer Pap smear or HPV testing services. Additionally, high out-of-pocket costs for screening tests further limit access, especially in low-income settings. These challenges collectively undermine the national goal of cervical cancer elimination.³⁻⁵

According to data from the Nigerian National System of Cancer Registries, cervical cancer accounted for approximately 15.1% of all female cancers between 2009 and 2016 in Anambra state, making it the second most common cancer among women in the region. However,

at the local government level, particularly in Nnewi-North, there is limited documentation of awareness levels, screening uptake, or HPV vaccination coverage among women.^{6,7} Since the success of preventive programs depends on local-level data and context-specific implementation strategies, assessing the knowledge, attitudes, and practices (KAP) of women in this area is critical for effective planning.

This study, therefore, aims to assess the knowledge, attitudes, and practices relating to cervical cancer, Pap smear screening, and HPV vaccination among women aged 21–65 years in Nnewi-North LGA, Anambra State. The findings will support the development of community and facility-level education strategies, integration of cervical screening within primary healthcare services, and advocacy for improved access and affordability of preventive services.

METHODOLOGY

Study Design

This study adopted a descriptive cross-sectional design with an analytical component. It assessed the knowledge, attitudes, practices, and barriers regarding cervical cancer, Pap smear screening, and HPV vaccination among women aged 21–65 years.

Study Area

The study was conducted in Nnewi-North Local Government Area (LGA) of Anambra State, Southeast Nigeria. The area comprises both urban and rural Primary Health Care (PHC) facilities, with a total of 15 PHCs in the LGA.

Study Population

The target population comprised women aged 21 to 65 years attending primary health centres in the LGA.

Sampling Technique

A multi-stage random sampling technique was employed. A total of 15 PHCs were selected. Eligible women were randomly selected within these PHCs using systematic random sampling (random number table).

Sample Size Determination

Sample size was calculated using Cochran's formula for estimating proportions in large populations (Cochran,

1977)⁸:

$$n_0 = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}$$

Where:

n = required sample size

Z = standard normal deviate (1.96 at 95% confidence level)

p = estimated proportion of women with good knowledge/practices (assumed to be 0.5 in absence of prior data)

d = margin of error (0.05)

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1 - 0.5)}{(0.05)^2} = 384$$

Accounting for a 10% non-response rate:
 $n_{\text{adjusted}} = \frac{384}{0.9} \approx 427$

A minimum sample size of 427 women was included in the study after adjusting for a 10% non-response rate.

Although multi-stage sampling was used, a design effect was not applied because sampling was conducted at the facility level with simple random selection of participants within each PHC, minimizing intra-cluster correlation.

Inclusion Criteria

Women aged 21–65 years who provided verbal consent and resided in Nnewi-North LGA were included.

Exclusion Criteria

Women with severe illness preventing participation or outside the age range were excluded.

Data Collection Instrument

A structured interviewer-administered, paper-based questionnaire (Appendix) was used. It included sections on:

1. Socio-demographics
2. Awareness of cervical cancer and HPV
3. Attitudes toward screening and vaccination
4. Practices and uptake of Pap smear/HPV vaccine
5. Barriers to access and service utilization

The questionnaire was pre-tested among 20 women in a non-selected PHC, and necessary modifications were made to improve clarity and relevance.

Ethical Considerations

Ethical approval was obtained from the NAUTH Health Research Ethics Committee. Verbal informed consent, approved by the Ethics Committee, was obtained from all participants. Confidentiality and anonymity were strictly maintained. The study was conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Data Analysis

Data were entered and analyzed using SPSS version 25 (IBM Corp, Armonk, NY, USA). Descriptive statistics (frequencies, means, percentages) were used to summarize variables. Inferential statistics (Chi-square tests, binary logistic regression) were used to explore associations between demographic characteristics and outcomes (e.g., knowledge or practice level). A p -value < 0.05 was considered statistically significant.

RESULTS

Demographic characteristics of study participants

A total of 402 respondents were included in the analysis,

out of the 427 questionnaires distributed, giving a response rate of 94.1%. As shown in Table 1 the respondents were predominantly within the reproductive age group, with the largest proportion aged 21–30 years, followed by those aged 31–40 years. Together, these two groups accounted for over 60% of the participants, while women aged 51–65 years constituted the smallest proportion. More than two-thirds (65.2%) of the respondents were married, whereas 28.1% were single, and smaller proportions were widowed (4.5%) or divorced (2.2%).

In terms of educational attainment, most of the respondents (69.7%) had secondary education, 21.9% had tertiary education, 5.5% attained only primary education, and a small proportion (3.0%) had no formal education. The dominant occupation among participants was business, reported by about 42% of respondents.

Regarding parity, nearly one-fifth (19.9%) had four children, while 18.7% had three children. Those with no children constituted 21.4% of the study population. Overall, the majority of respondents (71.1%) reported being sexually active at the time of the survey.

These findings indicate that the study population consisted mainly of young to middle-aged, married and educated women, characteristics typical of women attending primary health-care facilities in semi-urban communities.

Table 1: Socio-Demographic Characteristics of Respondents (N = 402)

Variable	Category	n	%
Age group (years)	21–30	133	33.1
	31–40	114	28.4
	41–50	76	18.9
	51–65	71	17.7
Educational level	No formal education	12	3.0
	Primary	22	5.5
	Secondary	280	69.7
	Tertiary	88	21.9
Marital status	Single	113	28.1

	Married	262	65.2
	Widowed	18	4.5
	Divorced	9	2.2
Sexually active	Yes	286	71.1
	No	116	28.9
Number of children	No child	86	21.4
	1 child	18	4.5
	2 children	63	15.7
	3 children	75	18.7
	4 children	80	19.9
	5 children	60	14.9
	6 children	17	4.2
	7 children	3	0.7

Awareness and Knowledge of Cervical Cancer

Most respondents (92%) reported that they had heard of cervical cancer while only a few (8%) indicated they had not heard of it. This suggests a generally high level of awareness of cervical cancer among women in the study area. When asked if cervical cancer is a serious health problem, the majority of respondents agreed that it is. There was a strong association between education level and cervical cancer awareness, as summarised in Table 2. As shown below, only 0% of women with no formal education had heard of cervical cancer, versus 90% of those with secondary schooling ($\chi^2=132.6$, $p<0.001$). This pattern was highly significant and indicates that more educated women were far more likely to be aware of cervical cancer.

Awareness also varied by marital status. In our sample, 100% of widowed and 80% of divorced women had heard of cervical cancer, compared with 59% of married and 67% of single women ($\chi^2 = 8.95$, $p = 0.030$). Although this difference was statistically significant, the small numbers in some marital-status categories mean that the chi-square assumptions may not be fully met, so the result should be interpreted with caution. Age group, number of children and sexual activity showed no

significant association with awareness (all $p>0.05$). In other words, aside from education and marital status, women of different ages, parity or sexual activity levels were similarly likely to have heard of cervical cancer.

Perceiving cervical cancer as a serious health problem was very common, but this perception did not vary significantly by any demographic predictor ($p>0.05$). About 70% of women overall said “yes” it is a serious problem, and this proportion was similarly high in all age, education, marital and other groups. No statistically significant differences were found, indicating that nearly all subgroups recognized cervical cancer as a serious issue.

Respondents were asked what they believed to be the causes of cervical cancer. The majority of respondents (58.2%) correctly identified human papillomavirus (HPV) infection as a cause of cervical cancer. Approximately 50.5% of women also believed that having multiple sexual partners could predispose to the disease. In contrast, very few attributed cervical cancers to witchcraft (0.7%) or other unspecified causes (0.2%). About 15.9% of the respondents reported that they did not know the cause of cervical cancer. These findings indicate that while most participants demonstrated good

knowledge of the infectious aetiology of cervical cancer, a small proportion still held misconceptions or lacked

awareness of the underlying causes.

Table 2: Education Level vs Awareness and Attitudes (N = 402)

Education level	Cervical cancer heard (n)	Cervical cancer not heard (n)	Pap smear heard (n)	Pap smear not heard (n)	HPV vaccine heard (n)	HPV vaccine not heard (n)	Would recommend HPV vaccine (n)	Would not / not sure (n)
No formal	0	21	5	16	4	17	6	15
Primary	5	37	7	35	7	35	14	28
Secondary	86	9	84	11	32	63	34	61
Tertiary	39	3	33	9	30	12	31	11

Respondents were asked to identify categories of women they believed to be at risk of cervical cancer. Multiple responses were allowed. A majority (65.7%) correctly identified *any woman who has had sexual intercourse* as being at risk, while 13.2% believed it exclusively with *HIV infection*. A small proportion associated it exclusively with *only older women (9.0%)*, and 17.4% were uncertain. These findings suggest that while the majority understood that any sexually active woman can develop cervical cancer, misconceptions persist among some respondents, particularly regarding age and HIV status.

Knowledge and Attitudes toward Pap Smear Screening

Most respondents (75.9%) had heard about the Pap smear test, a key method for early detection of cervical cancer. This indicates that although awareness of cervical cancer was high, knowledge of the specific screening test was relatively lower. Respondents who had heard of Pap smear were further asked about its purpose. Nearly two-thirds (65.7%) correctly stated that the Pap smear is used to *detect early cervical changes* that may lead to cancer, while 23.4% incorrectly believed it is used to *treat cancer*. A smaller proportion (10.9%) reported that they *did not know* the purpose of the test. This suggests that

although many respondents had general awareness of the Pap smear, knowledge of its preventive purpose remains incomplete.

Awareness of the Pap smear test likewise rose sharply with education ($\chi^2=84.5$, $p<0.001$). Only about 24% of women with no/primary education had heard of Pap smear, compared to ~79–88% of those with secondary/tertiary education. The difference was highly significant, indicating that better-educated women were much more likely to know about Pap screening.

Pap smear awareness also showed a borderline association with marital status ($\chi^2=7.83$, $p=0.050$). In this sample, 100% of widowed women had heard of Pap smear, whereas about 61% of married and single women were aware. This was marginally significant ($p\approx 0.05$). It suggests marital factors may play a role, although the dominant effect is from education. No other demographics (age group, children, sexual activity) were significantly related to Pap smear awareness ($p>0.05$).

Only a minority of respondents reported ever undergoing a Pap smear. As shown in Table 3, 11.2% of respondents had been screened at least once, while 88.8% had never done a Pap smear. This indicates low utilization of screening services despite relatively high awareness.

Table 3: Utilization of Pap Smear Screening among Respondents (N = 402)

		Frequency	Percent
Valid	no	357	88.8%
	yes	45	11.2%
	Total	402	100.0%

Among respondents who had not done a Pap smear, various reasons were provided. The most common reason was *not knowing where to have the test done* (38.6%), followed by *lack of time* (25.4%) and *fear of the result* (18.2%). A smaller proportion reported that the test was *too expensive* (10.5%) or *not necessary* (7.3%). Chi-square tests found no significant associations between any demographic factor and having done a Pap smear (all $p > 0.05$). For instance, uptake was ~10% in the secondary-educated group and only ~5% in others (no formal, primary, tertiary), but these differences were not statistically significant.

Respondents were also asked how often they thought Pap smear should be done. Knowledge of the recommended screening interval ("correct frequency") was generally poor and showed no significant pattern by demographics ($p > 0.05$). Only a small fraction of women answered, "every 3 years" (the recommended interval), and most answered "every year" or "I don't know". Chi-square tests showed no significant associations with age, education, or other factors. Thus, no socio-demographic variable strongly predicted correct knowledge of Pap smear frequency.

None of the socio-demographic factors showed a significant association with willingness to have a free Pap smear (all $p > 0.05$). Overall, about 70% of women said they would get a Pap smear if it were offered for free, and this was fairly uniform across age, education, marital status, parity, and sexual activity (for example, ~68–72% would agree in each group). In short, willingness for free screening was high and did not differ significantly by the measured demographics.

Knowledge of Human Papillomavirus (HPV) and Vaccination

Most respondents were aware of the human papillomavirus (HPV) vaccine. As many as 86.3% of participants had heard of the vaccine. This high awareness reflects increasing dissemination of

information on cervical cancer prevention in the study area.

Respondents who had heard of the vaccine were further asked about its purpose. The majority (84.6%) correctly stated that the HPV vaccine prevents cervical cancer, while 13.9% reported that they did not know its purpose. A very small proportion (1.2%) incorrectly believed it serves as a form of birth control. These findings indicate that knowledge of the vaccine's preventive role is generally good, though some uncertainty remains.

Education level was strongly associated with having heard of the HPV vaccine. In our data, only ~17% of women with primary education vs 71% with tertiary education knew about the HPV vaccine ($\chi^2 = 32.3$, $p < 0.001$). For example, 30/42 (71%) of tertiary-educated women had heard of HPV vaccine compared to 7/42 (17%) of primary-educated women. No other factor (age, marital status, etc.) showed a significant effect ($p > 0.05$). This mirrors findings that HPV awareness is lower in less educated groups.

A substantial proportion (69.6%) of respondents reported knowing at least one person who had received the HPV vaccine, suggesting increasing visibility of vaccination within the community. Most respondents (83.5%) indicated that they would recommend the HPV vaccine to other women. Educational attainment was also the only significant predictor of willingness to recommend HPV vaccination ($\chi^2 = 21.7$, $p < 0.001$). In particular, 74% of tertiary-educated women said they would recommend the vaccine, compared to only ~30–36% in lower-education groups. This suggests educated women had more positive attitudes toward HPV vaccination. No other demographic showed a significant association ($p > 0.05$). These results are in line with literature noting that lower education correlates with lower HPV awareness and acceptance.

Despite the generally positive attitude, some respondents expressed reservations about HPV vaccination. As

shown in Fig 1, the most frequently reported concern was *safety* (51.4% of cases), followed by *lack of information* (26.8%) and *cultural or religious objections* (25.4%). Cost (9.2%) and other unspecified issues (7.0%) were

less common. These findings highlight that while awareness is high, confidence in vaccine safety and access to accurate information remain important public-health considerations.

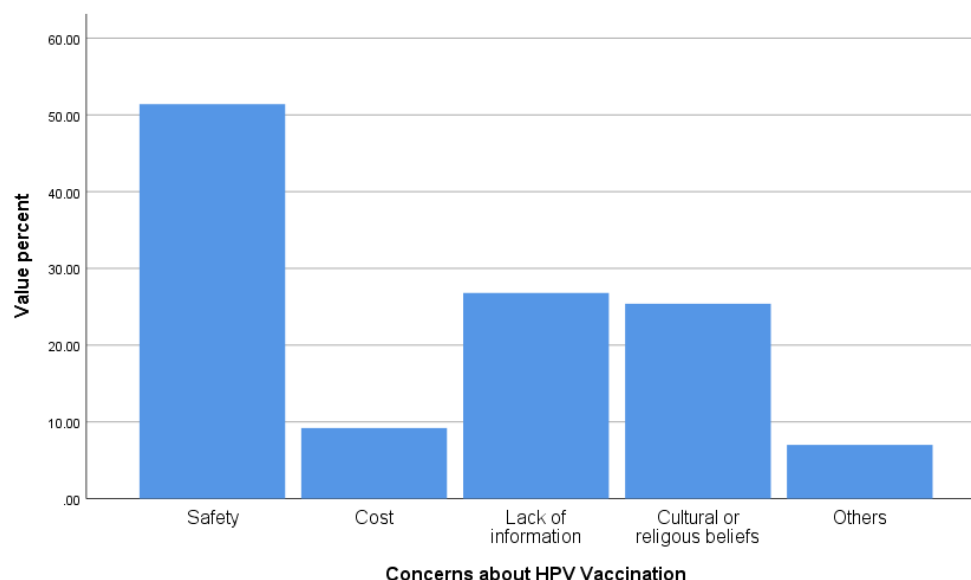


Fig 1: Reported Concerns Regarding HPV Vaccination among Respondents (Multiple Responses Allowed)

A large majority of respondents (93.3%) indicated that they would be willing to undergo a Pap smear test if it were offered free of charge. This reflects a strong latent interest in screening when financial barriers are removed. Similarly, 96.8% of respondents stated they would encourage other women to undertake Pap smear screening.

Respondents were asked to indicate their preferred channels for receiving information on cervical cancer prevention. The most commonly preferred channel was *primary health-care (PHC) talks* (76.8%), followed closely by *church or mosque gatherings* (70.0%). *Radio/television* and *social media platforms* were each selected by 47.1% of respondents, while only a few (6.0%) preferred other means of communication. Education level emerged as the most consistently significant factor: women with higher education were much more likely to be aware of cervical cancer, Pap smear screening, and the HPV vaccine (all $p < 0.001$), and they were also more willing to recommend HPV vaccination. Marital status had a weaker effect, being significant only for cervical cancer and Pap smear awareness in this sample ($p \approx 0.03-0.05$). Other factors (age group, parity, sexual activity) showed no significant associations with any of the outcomes. In summary, educational attainment was the key predictor of

knowledge and attitudes about cervical cancer prevention. These results underscore the importance of targeting education in efforts to improve cervical cancer screening and vaccination uptake.

DISCUSSION

This study demonstrates a marked disconnect between awareness and actual preventive practice regarding cervical cancer among women in Southern Nigeria. Although awareness of cervical cancer and positive attitudes toward prevention were relatively high, uptake of Pap smear screening and comprehensive understanding of HPV vaccination remained poor. Most importantly, educational level emerged as the strongest and most consistent determinant of awareness and attitudes toward cervical cancer prevention, showing statistically significant associations with knowledge of cervical cancer, Pap smear screening, HPV vaccination, and willingness to recommend HPV vaccination ($p < 0.001$). In contrast, marital status showed only a modest association with awareness outcomes, while age, parity, and sexual activity were not significantly associated with knowledge, attitudes, or practices. These findings highlight education as a critical leverage point for improving cervical cancer prevention efforts in this setting.

Awareness and Knowledge of Cervical Cancer

In the present study, most respondents (92%) reported that they had heard of cervical cancer, indicating a generally high level of awareness among women in the study area. This aligns with findings from south-eastern states such as Enugu and north-central regions like Kwara, where awareness levels of around 70–80% have been reported among community and faith-based women's groups.^{9,10} In contrast, studies from the northeast and urban slum communities of Lagos have shown much lower awareness, with fewer than half of women familiar with the disease.^{11,12} These regional disparities likely reflect differences in education, access to health information, and exposure to organized screening campaigns, a pattern similarly observed across many low- and middle-income countries.

Despite the high awareness of cervical cancer observed in this study, misconceptions regarding its aetiology persist. In the present study, 58.2% of respondents correctly identified human papillomavirus (HPV) as the causative agent of cervical cancer. This finding is comparable to reports from southwestern Nigeria and northern tertiary institutions, where only about half of women recognized the causal link between HPV and cervical cancer.^{13,14} Collectively, these results reinforce a consistent pattern of moderate knowledge of HPV as the principal etiologic agent across Nigerian regions, mirroring findings from other LMICs where HPV literacy remains limited despite increased awareness of cervical cancer.^{15,16}

In this study, 15.9% of respondents did not know the cause of the disease, and a few (0.7%) attributed it to witchcraft or spiritual influences. Similar beliefs have been documented in south-eastern Nigeria, including Enugu and Anambra States, where ignorance, illiteracy, and stigma contribute to misinterpretation of the disease.¹⁷ These findings highlight the ongoing influence of sociocultural and religious beliefs on health perception and underscore the need for culturally sensitive educational interventions.

Educational attainment was the strongest predictor of cervical cancer awareness. Women with secondary or tertiary education were overwhelmingly aware of the disease, whereas those with little or no schooling were not. This is consistent with published evidence that higher education (and related socioeconomic status) is strongly linked to knowledge and uptake of cervical

cancer prevention measures. This aligns with findings by Muhammad et al¹⁴, who reported significantly higher awareness among tertiary students, and by Olajide et al¹³, who noted that women with greater educational attainment were more likely to recognize HPV as a sexually transmitted infection and understand the role of vaccination in prevention. Both are Nigerian studies. Similarly, Ikpeama et al¹⁷ in south-eastern Nigeria observed that low literacy and poor access to health information hindered understanding of cervical cancer in rural communities. Collectively, these findings confirm education as a pivotal determinant of cervical cancer knowledge and awareness. Efforts to improve community knowledge should therefore incorporate literacy-sensitive communication strategies and leverage popular community platforms such as churches, markets, and radio programs.

Knowledge and Attitudes Toward Pap Smear Screening

In the present study, awareness of Pap smear screening was moderate, with 75.9% of respondents reporting that they had heard of the test. This proportion is higher than figures reported in some Nigerian populations, such as 29.6% in Bayelsa state, but comparable to findings among female health professionals in Ilorin, where nearly all participants were aware of the test due to occupational exposure.^{18,19} However, awareness did not always translate into accurate understanding. Only 65.7% of respondents correctly identified the Pap test as a method for detecting precancerous cervical lesions. Similar findings have been reported in other regions, where many women were aware of cervical screening but misunderstood its preventive purpose.²⁰ These results emphasize the need to strengthen public education on the role of Pap smear screening in early detection and cancer prevention.

Despite moderate awareness, utilization of Pap smear services was low in this study, with only 11.2% of women reporting ever having been screened. This figure is comparable to findings from other Nigerian populations, where screening uptake typically ranges between 4% and 20%. Even among well-informed groups such as university students and healthcare professionals, participation rarely exceeds 25%.^{19,21,22} These patterns highlight a persistent gap between awareness and actual screening practice, suggesting that barriers beyond knowledge such as accessibility, cost, and fear, continue to limit utilization.

Pap smear awareness was substantially higher among women with higher education. For example, 79–88% of secondary/tertiary-educated women had heard of Pap testing versus only ~15% of those with no/primary education. Prior studies similarly report that age, income and education correlate with Pap smear awareness.¹⁹⁻²²

In this study, 93.3% of respondents expressed willingness to undergo Pap smear screening if it were provided free of charge, highlighting the substantial role of cost and accessibility in determining screening behaviour. This finding aligns with studies from other parts of Nigeria, where the cost of testing and distance to screening centres were identified as key deterrents.¹⁸ In Nnewi for instance, an older study Ubah et al²³ reported that time constraints, fear of results, and lack of information on where and when screening is offered were significant predictors of non-participation. These consistent observations across regions emphasize that while willingness is high, economic and structural barriers remain major obstacles to effective cervical cancer prevention.

We also found that fear, misinformation, and limited availability of screening services emerged as consistent barriers in this and other Nigerian studies. Many women reported not knowing where Pap smear testing was available, a challenge also documented in Abakaliki and Bayelsa, where over half of respondents lacked this information.^{18,22} Even among healthcare workers in Ilorin, where access was relatively better, only about one-fifth had ever undergone screening.¹⁹ These findings suggest that barriers extend beyond awareness to include systemic and psychosocial factors.

These findings are comparable to those reported in other low- and middle-income countries, where awareness levels remain modest and knowledge gaps persist. In Gabon, Assoumou Mabika et al found that 67.5 % of women had heard of cervical cancer, yet only 27.6 % understood the purpose of the Pap test and fewer than 20 % had ever been screened.²⁴ In South Africa, Gwavu-Murray et al. reported that 58 % of women were aware of Pap smears, but misconceptions and fear of pain or embarrassment limited participation despite generally positive attitudes.²⁵ Similarly, in Sudan, Said Fazari et al. observed that while 70% of respondents expressed willingness to undergo screening, only 16 % had ever done so, citing barriers such as lack of awareness (49 %), cost (32 %), and limited availability of services (28 %).²⁶

The 11.2% of women reported ever having a Pap smear from this study is modest relative to pooled estimates in Sub-Saharan Africa, where screening uptake has been reported at approximately 10.5% (95% CI 7.5–13.5%).²⁷ No socio-demographic characteristics showed a significant link to actual Pap smear uptake. This low rate of screening regardless of demographics is consistent with reports that cervical screening remains underused even among aware populations.¹⁹⁻²² In other words, factors like education or marital status did not predict who got screened, at least in this sample.

Moreover, wealth-related analyses from 18 resource-constrained countries revealed even wider gaps: only 11% of women in the lowest socioeconomic quintile utilised screening services versus substantially higher rates in the richest groups.²⁸ These comparisons highlight that the screening level in Nnewi-North LGA is broadly consistent with regional norms, but still far from the type of coverage required by global elimination targets.

Overall, the gap between awareness and screening practice appears to be driven by poor health communication, cost, and inadequate service coverage. Addressing these issues requires sustained community-based education to dispel myths, build confidence in screening, and ensure that Pap smear testing is integrated into routine reproductive and maternal health services.

Knowledge and Perception of HPV Vaccination

In this study a large proportion (86.3%) were aware of the HPV vaccine, and most respondents demonstrated positive perceptions of its usefulness as a preventive strategy. However, despite this encouraging level of awareness, knowledge gaps were evident, particularly regarding the rationale for vaccination. These knowledge gaps suggest that while basic awareness exists, deeper understanding remains limited among women in this population.

This finding is consistent with other studies from Lagos, where mothers expressed favorable attitudes toward HPV vaccination despite limited knowledge.²⁹ Similarly, Imarengiaye et al³³ reported that although students had mixed levels of HPV knowledge, many held positive views toward the vaccine and were receptive to school-based vaccination initiatives. Across Nigerian studies, high acceptance and positive perception tend to coexist with poor understanding, suggesting that attitudes are driven more by trust in vaccines than by detailed knowledge of HPV pathogenesis.

Education again stands out: better-educated women were far more aware of HPV vaccine and more willing to recommend it. For example, nearly three-quarters of tertiary-educated women would recommend vaccination, versus only about one-third of women with primary or no schooling. This echoes prior observations that socio-economic factors drive HPV vaccine attitudes.^{29,30}

Several barriers contribute to low vaccine confidence nationally. In the present study, safety concerns, lack of adequate information, and cultural or religious reservations were the most frequently expressed fears. Similar patterns were observed in Benin, where fear of side effects was the dominant reason for refusing vaccination.³⁰ In Calabar, misconceptions linking HPV vaccination with promiscuity and religious objections were notable deterrents.³¹ Findings from Lagos further revealed that inadequate knowledge was a key contributor to vaccine hesitancy among mothers.²⁹ These recurring themes highlight the pervasive role of misinformation and the absence of a coordinated national communication strategy.

Willingness to participate in preventive services was, however, remarkably high. In this study, 85.3% of respondents indicated they will recommend the vaccine to a relative or friend, similar to the positive attitudes documented in Lagos and Benin.^{29,30} These findings suggest that the primary limitation is not reluctance, but access, information gaps, and system-level barriers, meaning uptake can improve dramatically if health services are made affordable, available, and community-centred.

In line with our findings of high willingness yet moderate detailed knowledge, evidence from other low- and middle-income countries show that actual uptake of the HPV vaccine remains low: a systematic review of females in East Africa reported sub-optimal vaccine coverage.³² Additionally, a systematic review of sub-Saharan Africa documented persistent structural and informational barriers to HPV vaccination, including cost, lack of awareness, and logistic challenges of rollout.³³

Together, these findings suggest that while our study area's willingness to participate in preventive services is strong, the gap between awareness and actionable uptake mirrors broader regional and global patterns of HPV-vaccination and screening readiness.

IMPLICATIONS FOR PRACTICE AND POLICY

Strengthening targeted community-based health education, particularly for women with lower levels of formal education, remains essential for improving understanding of cervical cancer risks and the value of early detection. Expanding access to affordable or free Pap smear screening through primary health centres, outreach clinics and mobile services would help reduce financial and logistical barriers that currently limit uptake. Integrating HPV vaccination and cervical cancer prevention into routine primary healthcare delivery, including antenatal and postnatal services, would ensure that prevention becomes a standard component of women's health rather than an optional add-on. These measures, combined with clearer referral pathways, improved health communication and sustained government investment, are critical for advancing Nigeria's cervical cancer elimination goals and ensuring that prevention efforts reach women who are most at risk.

CONCLUSION

Overall, the findings of this study demonstrate a familiar pattern observed across Nigeria: relatively high awareness and generally positive attitudes toward cervical cancer prevention, but persistently poor preventive practice. Educational level emerged as the most consistent and significant determinant of knowledge and attitudes, with women who had higher educational attainment being significantly more aware of cervical cancer, Pap smear screening, and HPV vaccination, and more willing to recommend HPV vaccination. In contrast, marital status showed only limited associations, while age, parity, and sexual activity were not significantly related to preventive knowledge or practices. Persistent knowledge gaps, sociocultural beliefs, misinformation, cost, and limited access to screening services continue to fuel low utilization of Pap smear screening and incomplete understanding of HPV vaccination. Consistent with findings from other Nigerian studies, these results underscore the need for stronger community-based education, faith-based and school-based advocacy, subsidized or free screening, and integration of cervical cancer prevention into routine primary healthcare services. Addressing both structural and educational barriers is essential to improving screening participation and reducing the cervical cancer burden in communities such as Nnewi-North LGA.

DECLARATIONS

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Ethics Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi (Reference number: NAUTH/CS/66/VOL.14/VER.3/284/2021/064). As this was a retrospective study using anonymized data, the Ethics Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi, waived the requirement for written informed consent. For participants without formal education, informed consent was obtained from their legal guardians or appropriate representatives in accordance with institutional guidelines and ethical standards. The study was conducted in accordance with the Declaration of Helsinki and all relevant institutional guidelines and regulations.

Consent for publication

Not applicable

Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Author Contribution

All authors played a substantive role in shaping this study and developing the manuscript. K.G.I. conceptualised the work and designed the overall study framework. Data analysis, interpretation of data and validation of findings were carried out collaboratively, with each author contributing to the discussions that informed the final results. K.G.I., C.E.E. and K.O.O. prepared the initial manuscript draft, covering the introduction, methods, results and discussion. Co-authors strengthened the analysis, offered detailed revisions and enhanced the clarity and coherence of the final document. Every author reviewed the complete manuscript, approved the final version and accepted responsibility for the integrity of the work.

Competing Interest

The authors declare no competing interests.

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