

# Hpv Vaccine Knowledge and Hesitancy among Healthcare Workers in Anambra State

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## ABSTRACT

Human papillomavirus (HPV) vaccination remains a cornerstone of cervical cancer prevention and the control of other HPV-related malignancies. Healthcare workers are critical to the success of vaccination programmes, as their knowledge, attitudes, and recommendations strongly influence public acceptance. This study assessed the level of knowledge, willingness, and factors influencing hesitancy toward HPV vaccination among healthcare workers in Anambra State, Nigeria. A cross-sectional study was conducted among 430 healthcare workers selected using a multistage stratified random sampling technique across public and private health facilities. Data were collected using a structured, self-administered questionnaire and analysed with IBM SPSS version 26. Descriptive statistics were used to summarise key variables, while inferential analyses—including chi-square tests, independent t-tests, analysis of variance, and correlation analysis—were employed to examine associations between knowledge, willingness, and selected sociodemographic characteristics. Statistical significance was set at  $p < 0.05$ . Overall, knowledge of HPV and its vaccine was high, with 91.6% of respondents demonstrating adequate knowledge. Awareness of the association between HPV and cervical cancer was high; however, knowledge that HPV affects both males and females was comparatively lower. Willingness to accept and recommend HPV vaccination was also high, with 81.4% of respondents exhibiting high willingness. Vaccine safety concerns and fears of long-term side effects were the most commonly reported factors influencing hesitancy. Knowledge scores differed significantly by age, profession, and practice location, while willingness varied by marital status, religion, level of healthcare, and practice location. A weak but statistically significant positive correlation was observed between knowledge and willingness to accept HPV vaccination ( $r = 0.152$ ,  $p = 0.002$ ). In conclusion, healthcare workers in Anambra State demonstrated high levels of knowledge and strong willingness to support HPV vaccination, despite residual concerns and misconceptions. Strengthening targeted continuing professional education, ensuring sustained institutional support, and improving vaccine availability may further enhance healthcare worker advocacy and HPV vaccine uptake.

**Keywords:** Human papillomavirus; HPV vaccine; vaccine hesitancy; healthcare workers; Anambra; cervical cancer prevention.

## INTRODUCTION

Cervical cancer occupies a distinctive position in global oncology as the first malignancy conclusively demonstrated to be entirely attributable to persistent infection with a single infectious agent, the human papillomavirus (HPV).<sup>1</sup> Despite being largely preventable, cervical cancer remains a major public health challenge worldwide, with more than 70% of cases occurring in low- and middle-income countries (LMICs).<sup>2</sup> HPV is among the most prevalent sexually transmitted infections globally, with over 200 identified genotypes, at least 14 of which are classified as high-risk due to their oncogenic potential.<sup>3-4</sup> Persistent infection with these

high-risk genotypes is a necessary precursor for the development of cervical cancer and several other malignancies.

Globally, cervical cancer accounts for approximately 350,000 deaths annually and ranks as the fourth most common cancer among women.<sup>5</sup> The oncogenic impact of HPV extends beyond cervical cancer alone, as the virus has been strongly implicated in cancers of the oropharynx, anus, penis, vulva, and vagina.<sup>6-7</sup> Collectively, HPV-related malignancies contribute an estimated 4.5% of all new cancer cases worldwide.<sup>7</sup> While high-income countries have achieved significant reductions in HPV-related disease incidence and mortality through organised screening and vaccination programmes, similar progress has not been realised in many LMICs, where access to preventive services remains constrained.<sup>2-3</sup>

Nigeria exemplifies this inequity, with one of the highest reported prevalences of HPV infection globally, estimated at approximately 32%, nearly three times the global average of 11%.<sup>8-9</sup> The national burden of cervical cancer is substantial, with over 12,000 new cases and nearly 8,000 deaths recorded annually, translating to one cervical cancer-related death every two minutes.<sup>10-11</sup> These figures underscore the urgent need for effective and sustainable preventive strategies within the Nigerian health system.

HPV is transmitted primarily through sexual contact, and there is currently no curative treatment for established HPV infection. Consequently, prophylactic vaccination represents the most effective strategy for primary prevention of HPV infection and its associated malignancies.<sup>21-22</sup> In recognition of this, the World Health Organisation launched the Cervical Cancer Elimination Initiative in 2020, setting an ambitious target of reducing cervical cancer incidence to fewer than four cases per 100,000 women by 2030.<sup>12</sup> In alignment with this global agenda, Nigeria formally incorporated the HPV vaccine into its routine immunisation schedule in October 2023.<sup>13-14</sup> Despite the proven safety, efficacy, and cost-effectiveness of HPV vaccination, implementation has been undermined by widespread misinformation, limited awareness, cultural misconceptions, and vaccine hesitancy, resulting in suboptimal uptake.

Healthcare workers play a pivotal role in shaping public perceptions and acceptance of vaccines. Evidence consistently demonstrates that recommendations from healthcare professionals significantly influence parental and caregiver decisions regarding vaccine uptake.<sup>15-16</sup> However, effective advocacy depends on healthcare workers possessing adequate knowledge, confidence, and personal conviction regarding vaccine safety and efficacy. Emerging evidence from Nigeria and comparable settings indicates the presence of notable knowledge gaps, misconceptions, and attitudinal hesitancy toward the HPV vaccine even among healthcare professionals.<sup>17-20</sup> Such deficiencies raise concerns about the success of national HPV vaccination programmes, as hesitancy among healthcare workers may undermine patient education, weaken community trust, and compromise broader public health communication efforts.

HPV vaccination has been shown to prevent up to 95% of infections caused by high-risk HPV genotypes when administered prior to sexual debut and offers substantial economic advantages over the treatment of established HPV-related malignancies.<sup>21-23</sup> Despite these benefits, vaccine uptake in Nigeria remains low and uneven, with marked variations across regions and professional cadres. Although Anambra State has demonstrated commitment to implementing the national HPV vaccination programme, persistent barriers such as misinformation, cultural beliefs, weak advocacy, and inadequate risk communication continue to limit programme effectiveness. Of particular concern is evidence suggesting that healthcare workers themselves may not be sufficiently equipped with the knowledge required to educate patients or may harbour hesitancy toward the vaccine, thereby diminishing their effectiveness as advocates.

Assessing the knowledge and attitudes of healthcare workers toward HPV vaccination in Anambra State is therefore both timely and strategically important. Evaluating levels of awareness, misconceptions, and vaccine hesitancy within this influential group can identify critical gaps requiring targeted training and communication interventions. Furthermore, exploring personal vaccine choices, such as willingness to vaccinate one's own children, provides valuable insight into how professional knowledge translates into personal conviction and community influence. Findings from this study have the potential to inform evidence-based policy decisions, strengthen healthcare worker engagement, and enhance the overall success of HPV vaccination programmes in Nigeria.

## METHODOLOGY

This study adopted a cross-sectional design to assess healthcare workers' knowledge of the human papillomavirus (HPV) vaccine and the prevalence of vaccine hesitancy.<sup>24</sup> The study was conducted in Anambra State, located in south-eastern Nigeria. The state has a well-developed healthcare system encompassing tertiary, secondary, and primary levels of care. Tertiary services are provided by three major referral institutions: the Federal Medical Centre, Onitsha; the Nnamdi Azikiwe University Teaching Hospital, Nnewi; and the Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka. Secondary healthcare is delivered through approximately 36 government-owned general and specialist hospitals, while primary healthcare services are provided by an estimated 617 primary health centres offering routine immunisation, maternal and child health care, and preventive services. In addition, over 1,000 registered private hospitals, clinics, and maternity homes complement public healthcare delivery across the state, making Anambra State a suitable and representative setting for the study.<sup>25–27</sup>

The study population comprised healthcare workers employed in public and private healthcare facilities across the state. Eligible participants were actively practicing healthcare workers who were parents or guardians of female children aged 9–15 years. Non-healthcare workers, non-practicing healthcare workers, interns, and healthcare workers whose female children fell outside the specified age range were excluded. Healthcare workers included medical doctors, nurses, midwives, community health officers, community health extension workers, pharmacists, medical laboratory scientists, health educators, and other relevant clinical personnel. Sample size was determined using Cochran's formula for cross-sectional studies, with adjustment for anticipated non-response and incomplete data, resulting in a final sample size of 430 participants.<sup>28</sup> A multistage stratified random sampling technique was employed to ensure proportional representation across levels of care and professional categories while minimising selection bias.<sup>29</sup> Healthcare facilities were first stratified by level of care and randomly selected from each stratum. Subsequently, healthcare workers within selected facilities were stratified by professional category, and participants were selected proportionally using simple random sampling.

Data were collected using a structured, self-administered questionnaire administered electronically. The instrument was developed following a review of relevant literature on HPV vaccination knowledge and vaccine hesitancy among healthcare workers.<sup>30–33</sup> Participation was voluntary, and informed consent was obtained electronically after participants reviewed the study information sheet. Data analysis was performed using IBM SPSS Statistics version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise study variables. Inferential analyses, including chi-square tests and correlation analyses, were conducted to examine factors associated with HPV vaccine hesitancy and the relationship between knowledge and hesitancy. Statistical significance was set at a p-value of <0.05. Ethical principles were strictly observed throughout the study. All responses were anonymised, confidentiality was maintained, and participants were informed of their right to withdraw from the study at any time without personal or professional consequences.

## RESULT

### Socio-demographic characteristics

A total of 430 healthcare workers participated in the study. The majority of respondents were aged 30–39 years (40.5%), followed by those aged 40–49 years (29.1%). Most participants were female (77.4%) and married (76.5%). A smaller proportion of respondents were single (20.9%), while divorced and widowed participants accounted for 0.7% and 1.9%, respectively. Christianity was the predominant religion among respondents (90.7%), followed by Islam (8.4%), with less than 1% identifying with other religions.

Table 1: Socio-Demographic Characteristics of Respondents

Variables (n=430)	Frequency (n)	Percentage (%)
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<b>Age (years)</b>		
20 to 29	69	16
30 to 39	174	40.5
40 to 49	125	29.1
50 to 59	62	14.4
<b>Mean ± SD</b>	<b>38.6 ± 8.8</b>	
<b>Sex</b>		
Female	333	77.4
Male	97	22.6
<b>Marital status</b>		
Divorced	3	0.7
Married	329	76.5
Single	90	20.9
Widowed	8	1.9
<b>Religion</b>		
Christianity	390	90.7
Islam	36	8.4
Other	4	0.9

### Socio-Economic Characteristics

Most respondents were employed in the public sector (86.5%), with only 13.5% working in private healthcare facilities. Public and community health professionals constituted the largest professional group (40.7%), followed by clinical care providers—including doctors, nurses, midwives, and pharmacists—who accounted for 18.6% of participants. Laboratory personnel and health information or administrative staff represented 10.0% and 15.3% of respondents, respectively. In terms of educational attainment, nearly half of the participants held a diploma (49.1%), while 35.6% possessed a BSc or MBBS degree; doctoral-level qualifications were rare (0.2%). The majority of respondents practised in primary healthcare facilities (68.4%), with fewer working in tertiary (21.4%) and secondary (10.2%) healthcare settings. More participants were based in rural areas (56.3%) than in urban locations (43.7%). With respect to professional experience, most respondents had 1–5 years of practice (43.0%), followed by those with 6–10 years of experience (20.7%), while only 10.7% had practised for 21 years or more.

Table 2: Socio-Economic Characteristics of Respondents

<b>Variables (n=430)</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Profession</b>		

Clinical Care Providers (Doctor, Nurse/Midwife, Pharmacist)	80	18.6
Health Information & Administrative Staff	66	15.3
Laboratory staff	43	10
Public & Community Health Workers (CHEW &CHO)	175	40.7
Others	66	15.4
<b>Highest educational qualification</b>		
BSc/MBBS	153	35.6
Diploma (OND/HND)	211	49.1
MSc	51	11.9
PhD	1	0.2
Others	14	3.3
<b>Type of facility of practice</b>		
Private	58	13.5
Public	372	86.5
<b>Level of healthcare provided at facility</b>		
Primary Health Care	294	68.4
Secondary Health Care	44	10.2
Tertiary Health Care	92	21.4
<b>Location of practice</b>		
Rural	242	56.3
Urban	188	43.7
<b>Experience (years)</b>		
1 to 5	185	43
11 to 15	55	12.8
16 to 20	55	12.8
21 and above	46	10.7
6 to 10	89	20.7
<b>Mean ± SD</b>	<b>10.1 ± 7.9</b>	

## Knowledge about HPV and the HPV Vaccine

Respondents demonstrated high overall knowledge of HPV and its vaccination. Most were aware of HPV (92.6%), its link to cancer (94.0%), the existence of an HPV vaccine (97.2%), and its inclusion in Nigeria's national immunisation schedule (94.9%). Awareness that HPV affects both males and females was lower (56.3%). The majority correctly associated HPV with cervical cancer (89.1%), although a small proportion incorrectly linked it to other cancers. Preventive knowledge was strong, with most respondents recognising the importance of vaccination before sexual debut (90.5%) and correctly identifying the recommended age group of 9–15 years (83.0%). Overall, 91.6% of respondents had adequate knowledge, despite some persisting misconceptions and limited formal training exposure.

Table 3: Knowledge of Knowledge of HPV and HPV Vaccine

Variables (n=430)	Frequency (n)	Percentage (%)
<b>Heard of Human Papillomavirus (HPV)</b>	398	92.6
HPV affects both males and females (n=398)	220	55.3
HPV can cause cancer (n=398)	381	95.7
HPV has a vaccine (n=398)	390	98
HPV vaccine is part of national immunization schedule in Nigeria (n=398)	379	95.2
HPV vaccine can be co-administered with other childhood vaccines (n=398)	287	72.1
HPV vaccine availability at facility or within LGA (n=398)	349	87.7
Think HPV vaccine can prevent other cancers apart from cervical cancer (n=398)	238	59.8
Received formal training on HPV or HPV vaccination (n=398)	249	62.6
<b>Type of cancer caused by HPV (n=398)</b>		
Breast Cancer	11	2.8
Cervical Cancer	372	93.5
Lungs Cancer	8	2
Prostate Cancer	7	1.8
<b>Knows HPV vaccine is most effective before sexual debut (n=398)</b>		
After sexual debut/exposure	31	7.8
Before Sexual debut/exposure	367	92.2
<b>Knows recommended HPV vaccine age range is 9–15 years (n=398)</b>		
0 – 5 years	14	3.5

9–15 Years	334	83.9
Anyone Above 18 years	28	7
Anyone Under 18 years	23	5.8

### Acceptance of the HPV Vaccine

Respondents demonstrated a strong positive disposition toward HPV vaccination across multiple indicators. Nearly all participants expressed willingness to vaccinate their daughters or wards (98.6%) and to recommend the vaccine to other parents or guardians (97.9%). Support was similarly high for the need for HPV vaccination among adolescent girls (97.6%), school-based vaccination programmes (96.8%), and the integration of the HPV vaccine into Nigeria’s routine immunisation schedule (98.1%). Willingness to vaccinate remained consistently high when respondents reported access to accurate information (98.4%) and confidence in the vaccine’s safety and efficacy (96.3%), and was only slightly lower when aligned with personal values (93.7%) or religious beliefs (90.0%). Overall, 81.4% of respondents exhibited high willingness toward HPV vaccination, while 17.4% showed moderate willingness and only 1.2% demonstrated low willingness.

### Factors Influencing Willingness and Hesitancy

Reported concerns about HPV vaccination were relatively limited and centred primarily on vaccine safety, which was cited by 59.1% of respondents, while concerns about potential long-term side effects were reported by 37.4%. Despite these concerns, most respondents felt adequately informed to make vaccination decisions (78.4%), and only a minority believed that HPV vaccination could encourage early sexual activity among adolescents (27.0%). Cultural and religious beliefs influenced vaccination attitudes in 31.4% and 34.2% of respondents, respectively, while misinformation from social media was reported as an influencing factor by 20.9%. Trust in institutional information sources was high, with 87.2% of respondents expressing confidence in messages from health authorities or government bodies. Nearly all participants agreed that education and sensitisation of healthcare workers would improve vaccine uptake (95.1%) and that endorsement by national or World Health Organization guidelines would increase their likelihood of recommending HPV vaccination (96.0%). Additionally, 97.2% believed that vaccine availability within their health facilities would enhance their confidence in recommending it, and 70.0% reported having administered or witnessed the administration of the HPV vaccine.

### Relationship between Level of Knowledge and Hesitancy among Healthcare Workers in Anambra State

#### Independent t-tests

Female participants demonstrated significantly higher knowledge scores compared with male participants (mean = 7.20, SD = 1.70 vs. mean = 5.89, SD = 3.39;  $t(428) = 5.17, p < 0.001$ ). Similarly, healthcare workers employed in public healthcare facilities had significantly higher knowledge scores than those working in private facilities (mean = 7.09, SD = 2.00 vs. mean = 5.66, SD = 3.25;  $t(428) = -4.62, p < 0.001$ ). In contrast, willingness to vaccinate did not differ significantly by sex, with comparable scores observed among females (mean = 41.96, SD = 4.46) and males (mean = 41.34, SD = 4.49;  $t(428) = 1.20, p = 0.229$ ). However, willingness scores were significantly higher among respondents working in public healthcare facilities compared with those in private facilities (mean = 42.04, SD = 4.48 vs. mean = 40.41, SD = 4.20;  $t(428) = -2.60, p = 0.010$ ).

#### One-way ANOVA

Knowledge scores varied significantly across age groups ( $p = 0.013$ ), professional categories ( $p = 0.009$ ), and practice locations ( $p = 0.018$ ). In contrast, no statistically significant differences in knowledge were observed with respect to marital status, religion, highest educational qualification, level of care, or years of professional experience. For willingness scores, statistically significant differences were observed across marital status ( $p = 0.016$ ), religion ( $p = 0.002$ ), level of healthcare ( $p < 0.001$ ), and practice location ( $p = 0.002$ ). Conversely, age

group, professional category, educational qualification, and years of experience were not significantly associated with willingness to vaccinate.

### Correlational Analysis

There was a weak but statistically significant positive correlation between knowledge and willingness scores ( $r = 0.152$ ,  $p = 0.002$ ), indicating that higher levels of knowledge were associated with increased willingness to accept HPV vaccination.

## DISCUSSION

This study provides important insights into the knowledge, willingness, and determinants of HPV vaccine hesitancy among healthcare workers in Anambra State, Nigeria. Overall, the findings demonstrate a high level of awareness and favourable disposition toward HPV vaccination, suggesting that healthcare workers in the state are well positioned to support national cervical cancer prevention efforts. This is particularly relevant given Nigeria's recent integration of the HPV vaccine into its routine immunisation programme and the critical role healthcare workers play in shaping public trust and vaccine uptake.<sup>34-36</sup> The high level of knowledge observed among respondents regarding HPV, its association with cancer, and the availability of a preventive vaccine aligns with findings from previous studies conducted among healthcare workers in Nigeria and other low- and middle-income countries.<sup>37-39</sup> This may reflect increasing professional exposure to HPV-related information following global and national policy shifts toward cervical cancer elimination. However, the relatively lower awareness that HPV infects both males and females highlights a persistent gap in comprehensive HPV knowledge. Similar gaps have been reported in other studies and may limit advocacy for broader, gender-neutral vaccination strategies.<sup>40-41</sup> Addressing this misconception is important, as male HPV infection contributes to transmission dynamics and to the burden of non-cervical HPV-related cancers.

Knowledge scores varied significantly by age group, profession, and practice location, with higher scores among female respondents and those working in public healthcare facilities. These differences likely reflect variations in exposure to immunisation programmes, access to in-service training, and routine involvement in public health initiatives, which are more prominent in the public sector.<sup>42-43</sup> The lack of association between knowledge and years of experience or highest educational qualification suggests that ongoing professional engagement and workplace context may be more influential than formal academic credentials alone. Willingness to accept and recommend HPV vaccination was remarkably high across multiple indicators. Nearly all respondents expressed readiness to vaccinate their daughters or wards, recommend vaccination to other parents, and support school-based vaccination programmes. This level of acceptance exceeds that reported in several earlier Nigerian studies conducted before national HPV vaccine rollout and reflects growing confidence in the vaccine.<sup>44-45</sup> Importantly, willingness remained high when respondents reported access to accurate information and trust in vaccine safety and efficacy, underscoring the central role of credible information in sustaining positive attitudes toward vaccination.<sup>46</sup>

Despite the overall favourable disposition, vaccine safety concerns and fears of long-term side effects emerged as the most common sources of hesitancy. Although such concerns were reported by a minority, their presence among healthcare workers is noteworthy, given their potential influence on patient decision-making. Similar safety-related concerns have been documented among healthcare workers globally and highlight the need for continuous professional education that addresses emerging evidence and post-marketing surveillance data.<sup>47-48</sup> Cultural and religious beliefs also influenced attitudes toward vaccination for some respondents, although these factors affected fewer participants compared with findings in studies involving the general population. This suggests that professional training may buffer, but not completely eliminate, sociocultural influences on vaccine decision-making.

Trust in official sources of information was high, with most respondents expressing confidence in messages from health authorities and government institutions. Furthermore, endorsement by national and World Health Organization guidelines, as well as improved vaccine availability at healthcare facilities, were identified as strong facilitators of vaccine recommendation. These findings reinforce evidence that institutional trust, clear policy guidance, and reliable vaccine supply chains are critical to successful immunisation programmes.<sup>49-51</sup> The

weak but statistically significant positive correlation between knowledge and willingness indicates that greater knowledge is associated with increased acceptance of HPV vaccination, although knowledge alone does not fully explain willingness. This supports existing literature suggesting that vaccine decision-making among healthcare workers is multifactorial, influenced by knowledge, trust, perceived norms, and practical considerations such as vaccine availability.<sup>52–53</sup> Differences in willingness by marital status, religion, level of healthcare, and practice location further highlight the need for context-specific engagement strategies.

## CONCLUSION

This study demonstrates that healthcare workers in Anambra State possess high levels of knowledge and a strong willingness to accept and recommend HPV vaccination. While residual misconceptions and safety concerns persist, overall attitudes toward HPV vaccination are highly favourable. The findings underscore the strategic importance of healthcare workers as advocates for HPV vaccination and cervical cancer prevention in Nigeria. Strengthening healthcare worker capacity through targeted education and institutional support is likely to enhance vaccine confidence and contribute significantly to achieving national and global cervical cancer elimination targets.

## RECOMMENDATIONS

Based on the findings of this study, several key recommendations are proposed to strengthen HPV vaccination uptake and healthcare worker advocacy. Regular, targeted continuing professional education should be prioritised to address identified knowledge gaps, particularly regarding HPV infection in males, vaccine co-administration, and protection against non-cervical cancers. In addition, sustained institutional support through clear and consistent endorsement of HPV vaccination by national health authorities and professional bodies is essential to reinforce healthcare workers' confidence and advocacy roles. Ensuring reliable availability of HPV vaccines across all levels of healthcare delivery, especially in primary and rural facilities, is also critical, as access to vaccines directly influences willingness to recommend vaccination. Furthermore, context-sensitive communication strategies that acknowledge sociocultural and religious considerations should be incorporated into training programmes to equip healthcare workers with the skills needed to address concerns effectively and respectfully. Finally, future research, including longitudinal and multi-state studies, is recommended to monitor changes in knowledge and attitudes over time and to better elucidate the relationship between healthcare worker education, advocacy, and community-level vaccine uptake.

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