



Research Article

Knowledge, Vaccine Uptake, and Barriers to Human Papillomavirus Vaccination in a Primary Healthcare Centre in Maiduguri: A Cross-sectional Study

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ARTICLE INFO:

Keywords:

Human
Papillomavirus,
Vaccine,
Mothers,
Girl-child.

ABSTRACT

Human Papillomavirus (HPV) infection is a major public health concern and a leading cause of cervical cancer, particularly in low- and middle-income countries. Despite the proven safety and effectiveness of the HPV vaccine, uptake remains low in many parts of sub-Saharan Africa, including Nigeria. Borno State, affected by prolonged conflict and weak health infrastructure, presents unique challenges to vaccine utilization. This study assessed the knowledge, utilization, and barriers to HPV vaccine uptake among mothers in Gwange PHC, Maiduguri. A descriptive cross-sectional survey was conducted among mothers attending PHC Gwange Ward, Maiduguri. Using a census sampling technique, all eligible mothers with female children aged 9–14 years were invited to participate. Data were collected using a structured, validated questionnaire covering socio-demographic characteristics, knowledge HPV vaccine, utilization and perceived barriers. A total of 98 completed questionnaires were analyzed using SPSS version 25. Descriptive statistics, including frequencies and percentages, were used to summarize the data. The findings revealed a moderate level of knowledge of HPV and its vaccine among respondents, with 66.3% having heard of HPV and 62.2% aware of the HPV vaccine. However, only 30.6% reported that their daughters had received the HPV vaccine, indicating low utilization. Although uptake was low, 61.2% of mothers expressed willingness to vaccinate their daughters in the future and as well recommend to other mothers to vaccinate their daughter. Major perceived barriers were fear of side effects, poor access to vaccination services, consulting husband, misinformation, and inconsistent vaccine supply. In conclusion, HPV vaccine utilization among mothers in Gwange remains low despite moderate knowledge and willingness to vaccinate. Enhancing health education, strengthening healthcare provider advocacy, addressing misinformation, and consistent vaccine availability are essential to improving HPV vaccine uptake and advancing cervical cancer prevention efforts in conflict-affected settings.

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INTRODUCTION

Human Papillomavirus (HPV) is one of the most prevalent sexually transmitted infections globally, with persistent infections leading to a range of diseases, including genital warts and several types of cancer, most notably cervical cancer. According to the World Health Organization [WHO], cervical cancer is the fourth most common cancer in women globally, accounting for over 350,000 deaths in the year 2022 (WHO, 2025). The highest rates of incidence and mortality are in sub-Saharan Africa, Central America and South-East Asia. These regional differences reflect inequalities in access to vaccination, screening and treatment services. (WHO, 2025). Vaccination against HPV, especially before the onset of sexual activity, has been proven to be a highly effective preventive measure, capable of preventing up to 90% of cervical cancer cases (Ginsburg, Eniu & Garner, 2022). To eliminate cervical cancer, all countries must reach and maintain an incidence rate of below 4 per 100 000 women. Achieving this goal, three key pillars must be accomplished; 90% of girls must be fully vaccinated with the HPV vaccine by the age of 15, 70% of women screened using a high-performance test by the age of 35, and again by the age of 45 and lastly 90% of women with pre-cancer treated and 90% of women with invasive cancer managed (WHO, 2025). Despite significant efforts to increase access to HPV vaccines and cervical cancer screening in LMICs, several barriers continue to hinder the uptake of these essential health services in the region (Omohwovo *et al.*, 2025).

In Africa, the burden of cervical cancer remains disproportionately high with 19 counties in the sub-saharan with the highest cervical cancer mortality rates globally (Lin & Liang, 2024). Although 29 African countries have now adopted the HPV vaccine, coverage remains uneven and generally low hovering around 52% for the first dose and much lower for the complete regimen. Countries like Rwanda, Ethiopia, and Mauritius have seen success with school-based vaccination and strong community mobilization, whereas others lag due to misinformation, vaccine hesitancy, health system barriers are widely cited in the literature as determinants of low HPV vaccine uptake in

Africa (Asempah, & Ikpebe, 2024; Murewanhema, 2024).

Cervical cancer is a major public health concern in Nigeria, placed as the second primary cause of cancer-related deaths for women and girls, with an estimate of over 12,000 new cases and an incidence rate of about 18.4 per 100,000 (Lawson *et al.*, 2023). The disease is mostly driven by persistent infection with human papillomavirus (HPV), which has a high prevalence of about 42% in Nigeria (Kabuga *et al.*, 2020). The effects of cervical cancer are profound, contributing significantly to morbidity, premature mortality, and socioeconomic burden, particularly among women in their reproductive and economically productive years. High mortality rates are worsened by late presentation, limited screening coverage, and low uptake of HPV vaccination, with many cases diagnosed at advanced stages when treatment outcomes are poor (Lawson *et al.*, 2023). Consequently, cervical cancer not only threatens women's health but also impacts families and national development through loss of productivity and increased healthcare costs, underscoring the urgent need for strengthened prevention, early detection, and treatment strategies in Nigeria (Lawson *et al.*, 2023).

In response to this, the Federal Ministry of Health launched the first phase of the national HPV vaccine rollout in October 2023, targeting over 7 million girls aged 9–14 years, with plans to integrate the vaccine into routine immunization by 2025. Initial reports from states involved in the rollout showed promising coverage of up to 96%, but regional disparities remain a concern, especially in northern Nigeria, where low literacy levels, religious beliefs, misinformation, and poor access to healthcare services impede vaccine acceptance and utilization (Adewumi, 2025). Borno State, situated in northeastern Nigeria, presents a unique context due to its prolonged history of armed conflict, displacement, and weak healthcare infrastructure. Gwange, a community in Maiduguri Metropolitan Council, hosts people of diverse culture living together. However, empirical data on the knowledge, attitudes, and utilization of the HPV vaccine among mothers in this region is lacking. Cultural conservatism, limited health education, and post-insurgency

rebuilding challenges may affect vaccine demand and delivery, even as knowledge of HPV-related diseases remains low.

Given this background, exploring the utilization of the HPV vaccine among mothers attending PHC facility in Gwange is critical. Mothers play a central role in healthcare decisions for their children, and their knowledge and attitudes directly influence uptake of the vaccine among adolescent girls. Understanding their level of knowledge, acceptance, and barriers to vaccine utilization will offer valuable insight for local health planners, immunization programs, and community engagement strategies, thereby contributing to national efforts toward cervical cancer prevention.

The Human Papillomavirus (HPV) vaccine is globally recognized as a safe and effective means of preventing cervical cancer (WHO, 2022), yet utilization rates remain critically low in many developing countries (Bruni *et al.*, 2021). Despite global efforts to increase HPV vaccine coverage, several factors including knowledge, cultural beliefs, and accessibility affect its uptake, especially in sub-Saharan Africa (Perlman *et al.*, 2014).

This study was therefore designed to determine the knowledge, vaccine uptake and barriers to human papilloma virus vaccination among mothers in Gwange primary healthcare center in Maiduguri, Borno state

METHODS

Research Design

The design was a descriptive cross-sectional survey design. This design is suitable because it enables the researcher to collect relevant data from a sample of mothers attending Primary Health Care in Gwange at a specific point in time to assess the knowledge, utilization and barriers of the HPV vaccine.

Settings

The setting was Primary Health Care Centre (PHC) Gwange III ward which is one of the largest and most densely populated wards within Maiduguri Metropolitan Council (MMC), Borno State, Nigeria. Gwange is a high-density residential area hosting an estimated population of over 40,000 people (part of the 1.2 million population of Maiduguri), predominantly occupied by Hausa, Kanuri and Shuwa Arab ethnic groups, with Islam as the major religion

(Mukhtar, Ali, & Usman, 2021 and Daily Trust/Manpower Nigeria, 2014). The area is characterized by low to middle-income households, with most women engaging in petty trading, small-scale businesses, or household management.

Target Population

The target population consists of all mothers attending Primary Health Care center in Gwange Ward. This group is relevant because they are directly involved in making vaccination decisions for themselves and their child. The total population is 158 women registered at the Antenatal unit of primary health care Gwange as of the year 2025 according to the Health Record.

Sample size and Sampling Technique

The total number of women attending Antenatal Care at Primary Health Care Centre in Gwange Ward as of October, 2025 were 158. Out of the 158 mothers, 98 met the inclusion criteria of having female children age between 9-14 years old. Therefore, given the manageable size of the population the study employs a Census sampling technique. This means all 98 women were included in the study.

Instruments for Data Collection

The main instrument for data collection was a structured self-administered questionnaire. The questionnaire was divided into four (4) sections to gather information on:

- Socio-demographic characteristics of the respondents.
- Knowledge of HPV and the HPV vaccine.
- Level of utilization of HPV vaccine.
- Barriers to uptake of the HPV vaccine.

Validity of the Instrument

To ensure validity, the questionnaire was reviewed by experts in Nursing Science and Public Health. Their feedback helps to confirm that the items accurately measure what they are intended to measure. A total of seven expert panelist were used for the validation through three rounds of Delphi process before arriving at a content validity index of 0.91.

Reliability of the Instrument

To ensure reliability, the pre-tested questionnaires was analyzed for consistency. The test-retest method was administered to the same group at two different times (two weeks apart) at Mairi Kuwait PHC, using 10

respondents. A reliability coefficient of 0.78 confirmed the consistency of the instrument.

Method of Data Collection

Before data collection, the purpose of the study was explained, and informed consent was obtained from each participant. The respondents were given enough time to complete the questionnaires, and assistance was provided where necessary to ensure accurate responses. However, only 98 women completely and

submitted their forms during the four weeks which data was collected.

Method of Data Analysis

Data that was collected were checked for completeness, coded, and entered into a computer for analysis using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics such as frequencies, percentages, mean and standard deviation were used to present the results in tables.

RESULTS

Table 1: Socio-Demographic Characteristics

Variables	Categories	Frequency	Percentage
Age (years)	18–25	15	15.3
	26–35	43	43.9
	36–45	30	30.6
	46 and above	10	10.2
Marital Status	Single	7	7.1
	Married	72	73.5
	Widowed	10	10.2
	Divorced	9	9.2
Educational Level	No formal education	18	18.4
	Primary	25	25.5
	Secondary	30	30.6
	Tertiary	25	25.5
Occupation	Housewife	22	22.4
	Petty trader	33	33.7
	Civil servant	25	25.5
	Cap knitting	18	18.4
Religion	Islam	87	88.8
	Christianity	10	10.2
	Others	1	1.0

Table 1 The results the socio-demographic profile of respondents shows that the majority were between 26–35 years (43.9%), followed by those aged 36–45 years (30.6%), indicating that most participants were in their economically active adult years. A large proportion were married (73.5%), suggesting stable family structures within the sample. In terms of education, respondents were fairly distributed across levels, with secondary education (30.6%) being the most common, while an equal proportion had primary (25.5%) and tertiary

education (25.5%), and 18.4% had no formal education. Occupationally, over one-third were petty traders (33.7%), followed by civil servants (25.5%), while 22.4% were full housewives. Religion-wise, the population was predominantly Muslim (88.8%), with Christianity (10.2%) and other religions (1.0%) making up a small minority. Overall, the table reflects a mainly married, working-age population with diverse educational backgrounds and predominantly Islamic religious affiliation.

Table 2: Knowledge of HPV vaccination

Item	Yes (%)	No (%)	Interpretation
Have you heard of HPV vaccine?	65 (66.3%)	33 (33.7%)	Moderate
Do you know what HPV vaccine is use for?	61 (62.2%)	37 (37.8%)	Moderate
Do you know that Human Papillomavirus (HPV) infection causes cervical cancer?	56 (57.1%)	42 (42.9%)	Moderate
Have you vaccinated your daughter against HPV?	30 (30.6%)	68 (69.4%)	Low
Do you think HPV vaccine is safe?	50 (51.0%)	48 (49%)	Moderate
Would you be willing to vaccinate your daughter if a health worker recommend to you?	52 (53.1%)	46 (46.9)	Moderate

Knowledge Classification:

- High knowledge: >70% Yes
- Moderate knowledge: 50–69% Yes
- Low knowledge: <50% Yes

This classification was based on the study of (Aldabayan *et al.*, 2025)

Table 2 show respondents’ knowledge on HPV vaccine indicate a generally moderate level of knowledge, as more than half of respondents had heard of HPV vaccine (66.3%) and as well know what the vaccine is use for (62.2%). Slightly over half (57.1%) also knew that HPV can cause

cervical cancer, reflecting a fair understanding of the infection’s health implications. However, 30.6% of respondents accepted to have vaccinated their daughters indicating low knowledge of vaccine as well as it benefits. Noticeable knowledge of respondents on the safety of vaccine is slightly above average (51.0%) signifying moderate knowledge. Also slightly above average (53.1) of the respondents are willing to recommend to mothers with daughters 9-14 years of age to take their daughters for HPV vaccination.

Table 2: level of Utilization of HPV Vaccine

Item	Yes (%)	No (%)	Interpretation
Has your daughter received the HPV vaccine?	30 (30.6%)	68 (69.4%)	Low
Do you know that HPV vaccine is recommended for girls age 9-14years?	25 (25.5%)	73 (74.5%)	Low
Are you willing to vaccinate your daughter in the future?	60 (61.2%)	38 (38.8%)	Moderate
Did a health worker recommend vaccination?	45 (45.9%)	53 (54.1%)	Low
Are you aware of the benefits of HPV vaccination for your daughter?	35 (35.7%)	63 (64.3%)	Low
Will you recommend the HPV vaccine to other mothers with girl children age 9-14 years?	60 (61.2%)	38 (38.8%)	Moderate

Knowledge Classification:

- Utilization: >70% Yes
- Moderate utilization: 50–69% Yes
- Low utilization: <50% Yes

This classification was based on the study of (Aldabayan *et al.*, 2025)

Table 3 shows level of HPV vaccine utilization among respondents is generally low, as only 30.6% reported that their daughters had received the vaccine, and an even smaller proportion (25.5%) know that HPV vaccine is recommended for girls age 9-14 years. Despite

this low uptake, more than half of the respondents (61.2%) expressed readiness to vaccinate their daughters in the future and as well willing to recommend the vaccine to other mothers who have daughter Of 9-14 years of age reflecting a moderate willingness to utilize the vaccine if opportunities or resources improve. Recommendations from health workers were low, with 45.9% receiving professional advice regarding vaccination. Furthermore, only 35.7% are aware of the benefits of the vaccine reflecting low utilization of the vaccine. Overall,

the table highlights a gap between willingness and actual vaccine uptake, suggesting the need

for improved access, awareness, and health worker involvement.

Table 4: Perceived Barriers to HPV Vaccine Uptake

Statement	SA(%)	A(%)	N(%)	D(%)	SD	Mean	SD	
I worry about possible side effects of the HPV vaccine.	50(51.0)	25(25.5)	8 (8.2)	10(10.2)	5(5.1)	3.07	1.10	
I find it difficult to access the HPV vaccine due to location.	42(42.9)	35(35.7)	8(8.2)	8(8.2)	5(5.1)	3.03	1.04	
I have heard conflicting information about the HPV vaccine.	38(38.8)	30(30.6)	15(15.3)	10(10.2)	5 5.1)	2.83	1.15	
Health facilities near me often lack HPV vaccine supply.	40(40.8)	32(32.7)	10(10.2)	10(10.2)	6(6.1)	2.91	1.13	
I need to consult my husband before taking my daughter for vaccination	60(61.2)	10(10.2)	7(7.0)	8(8.2)	13(13.3)	3.18	1.01	
Lack of awareness from health workers	42(42.9)	32(32.7)	0(0.0)	11(11.2)	13(13.3)	3.01	1.03	
Aggregate mean score							3.01	

The major perceived barrier was need to consult husband ($M = 3.18 \pm 1.01$), followed by side effects ($M = 3.07 \pm 1.10$), then accessibility ($M = 3.03 \pm 1.04$) and lack of awareness from health workers ($M = 3.01 \pm 1.03$). Misinformation ($M = 2.83 \pm 1.15$) and vaccine shortage ($M = 2.91 \pm 1.13$) were also substantial challenges. The average mean score of 3.01 reflects strong agreement that these barriers significantly hinder vaccine uptake.

DISCUSSION

The findings of the study revealed a moderate level of knowledge of HPV and its vaccine among mothers attending PHC Gwange. A majority had heard of the Human Papillomavirus (HPV), and aware what the vaccine is use for. Additionally, majority know that cervical cancer is caused by HPV. However, only few mothers had vaccinated their daughters. More so, slightly above half believe the vaccine is safe for their daughter and as well can recommend it to other mothers with children age 9-14 years. This pattern shows that although many mothers possess a basic knowledge of HPV vaccine and its health implications, their knowledge is not comprehensive enough to support strong vaccine acceptance or utilization. The moderate knowledge level observed is contrary with the findings of Adegboyega, Oladipo and Omotosho

(2020), who reported that, only a limited proportion mothers were aware of the HPV vaccine. Similarly, Okunade, Adejimi, & Oluwole (2021) found that less than one-quarter of mothers in Lagos understood the preventive role of the HPV vaccine. The disparity regarding knowledge recorded compared to the other studies could be because of the persistent enlightenment campaign that has been ongoing in radio and other places of worship. Additionally, the presence of Non-governmental organizations have greatly contributed. This is because of their presence in most of the communities and their proactive public health enlightenment messaging techniques. These results highlight persistent gaps in community-level health education and dissemination of vaccine-related information. The study underscores the critical role of nurses, community health workers, and PHC staff in bridging this knowledge gap. Integrating HPV and cervical cancer education into routine maternal and child health services, antenatal care, immunization clinics, and outreach programmes can significantly enhance mothers’ understanding and ultimately improve HPV vaccine acceptance and uptake.

The study indicates a low level of HPV vaccine utilization among mothers attending PHC Gwange. Only few of respondents reported

that their daughters had received the HPV vaccine, while a much larger proportion had not vaccinated their daughters. This might be due to lack of availability of vaccine and awareness from health workers. Despite this low uptake, it is noteworthy that a high percentage of mothers who had not vaccinated their daughters expressed willingness to do so in the future and as well willing to recommend to other mothers to take their daughters for vaccination. This suggests a positive attitude toward vaccination if appropriate support and information are provided. These results are consistent with previous studies from, Ezeanochie and Olagbuji (2014) reported similarly low HPV vaccine utilization in southern Nigeria, attributing the poor uptake to limited awareness, cost barriers, and lack of recommendations from health workers. Likewise, Donkoh, Boateng & Osei (2021) observed low uptake of the HPV vaccine in Ghana, highlighting persistent challenges such as accessibility issues and misconceptions surrounding the vaccine. The findings from the present study therefore reveal a significant gap between awareness and actual utilization of the HPV vaccine. Although many mothers demonstrate willingness to vaccinate their daughters and recommend to others, practical barriers including, limited availability, and insufficient health worker recommendations may hinder action.

The study revealed several barriers hindering the uptake of the HPV vaccine, including fear of side effects, difficulty accessing vaccination centers, misinformation and irregular vaccine supply as well as lack of awareness from health workers and consulting husband before accepting the vaccine. These results indicate that both individual and systemic factors contribute to the low utilization of the vaccine. This finding is consistent with Odetola (2015), who identified cultural and religious beliefs as barriers to HPV vaccine acceptance among northern Nigerian mothers. Similarly, Bello, Musa, and Ahmed (2024) reported that poor health infrastructure, cost, and vaccine shortages were key obstacles in northern communities. The concern about side effects and conflicting information suggests a lack of proper communication and trust between health workers and community members. Furthermore,

difficulty accessing vaccination sites reflects infrastructural challenges, including poor transportation and limited vaccine availability at PHC levels. Consulting husband before accepting the vaccine portray the type patriarchal society in northern Nigeria where male dominate decision making in the family. These findings emphasize the need for continuous public health education to dispel myths, improve vaccine confidence, and ensure steady vaccine supply chains. Strengthening health worker communication skills and integrating HPV vaccination into routine immunization can reduce these barriers and enhance vaccine accessibility for mothers and their daughters.

CONCLUSION

The study concluded that HPV vaccine utilization among mothers in Gwange remains low despite moderate knowledge levels. Mothers' decisions to vaccinate their daughters were largely depending on husband decision and healthcare worker recommendations. Conversely, fear, misinformation, and supply shortages hindered uptake. There is a need for targeted, culturally sensitive health education interventions to move beyond basic awareness toward comprehensive understanding of HPV, its vaccine, and its role in cervical cancer prevention. Additionally, addressing structural barriers is critical to translating willingness into actual uptake.

Limitation

This research has some limitations that should be considered when interpreting the findings. Firstly, the use of a single primary healthcare centre and a relatively small sample size limits the generalizability of the results to the wider population of mothers. Secondly, the cross-sectional design restricts the ability to establish causal relationships between knowledge, perceived barriers, and HPV vaccine uptake, and does not capture potential changes over time, especially in the context of ongoing vaccine rollout. Lastly, reliance on self-reported data introduces the possibility of recall and social desirability bias, which may have led to overestimation of knowledge and willingness to vaccinate, as well as inaccuracies in reporting daughters' vaccination status due to lack of verification with health records.

ETHIC

The research was approved by Borno State Health Research and Ethic Committee with approval number SHREC 183/2025 on 6th October, 2025.

CONFLICT OF INTEREST

The researchers declare that there is no financial or non-financial conflict of interest

ACKNOWLEDGEMENT

The researchers acknowledge with outmost gratitude the staff of the department of Nursing, University of Maiduguri as well as Gwange PHC for their support throughout the conduct this study

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