



Assessment of Human Papillomavirus Infection, Knowledge and Attitude among Women Infected with HIV in Minna, Niger State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Human Papillomavirus (HPV) is a debilitating sexually transmitted infection. Global in occurrence but common in developing countries. This study investigated the prevalence of Human Papillomavirus (HPV) infection among HIV-positive women attending gynaecological appointments at Minna General Hospital in Niger State, Nigeria and assessed their knowledge of HPV and attitudes toward HPV screening. The research involved 162 eligible participants who underwent HPV testing. A structured questionnaire was used for data collection and gynaecological examinations were conducted to obtain cervical cell samples, which were then processed and subjected to HPV testing using the Riatol quantitative PCR HPV genotyping test. The study revealed that 74% of the participants tested positive for HPV, with 41% having high-risk HPV (HrHPV) and 33% low-risk HPV (LrHPV). Despite elevated risk status, participants exhibited limited knowledge about HPV, with only 4% being aware of its link to cervical cancer, and 5%

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knowing about HPV vaccines. Encouragingly, 60% of participants had undergone HPV screening in the past five years, and 75% expressed willingness to undergo routine HPV screening if they were to collect the samples themselves (self-sampling). for HPV screening. The high prevalence of HPV, particularly the high-risk types, underscored the significance of HPV screening among HIV-positive women. However, participants showed a strong commitment to proactive healthcare behaviours. Collaborations with healthcare professionals and media outlets are recommended to enhance public awareness of HPV and its association with cervical cancer, ultimately reducing the burden of HPV-related diseases among this population.

Keywords: Prevalence; human papilloma virus; knowledge and attitude; HIV; women.

1. INTRODUCTION

Cervical cancer is a huge global health issue all over the world. Every year, there are 569,847 newly diagnosed cases, with approximately 311,400 deaths [1,2,3]. It ranks as the second prevailing cancer among females in developing and under-developed nations, particularly in Sub-Saharan Africa, where 83% of all recent cases occur [4]. The major cause of cervical cancer is the Human Papillomavirus (HPV) [5,6,7,8]. HPVs, like all papillomaviruses, only cause productive diseases in the mucous membranes or keratinocytes [9]. Most HPV genotypes produce no symptoms for several people, whereas others can originate warts (verrucae) and, in a few cases, malignancies of the vulva, vagina, cervix, penis, anus, and oropharynx [9,1]. The HPV genome is made up of a tiny Deoxyribonucleic Acid (DNA) with roughly 8000 base pairs [10].

Over 150 kinds of HPV have been pinpointed to date. A subset of data from a meta-analysis revealed that the five general types of HPV globally were HPV16, HPV18, HPV52, HPV31, and HPV58 [11,6,10,12]. The International Agency for Research on Cancer has categorized the various types of HPV as low-risk or high-risk depending on their capacity to cause cancer. Fourteen HPV types (HPV16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, and 68) have been pinpoint as carcinogenic and are being examined comprehensively for their involvement in cervical cancer [13,9,10,12]. HPV contagion is a public health concern since it is a common sexually transmitted infection (STI). It is reported that 600 million individuals globally have HPV and that 75-80% of the world will be affected by this virus at a particular point in their lives [14,15]. The virus is normally eliminated by the human immune system after a period of being infected [16]. Chronic infections with specific HPV genotypes may lead to cellular changes that progress to cervical intraepithelial

neoplasia and, ultimately, invasive cervical cancer [9]. HPV infection affects 10.4% of females who have normal cervical cytologic results globally. Underdeveloped countries have a greater prevalence: 22.1% and 20.4% in Africa and Central America respectively, in comparison to 11.3%, 8.1%, and 8.0% in Northern America, Europe, and Asia respectively [17]. A 2010 study on females with normal cytology found the lofty frequency of HPV (23.2%) in females under the age of 25 [14]. In women between 25 to 34 years and over 35 years, the frequency reduced to 8.7% and 5%, respectively. However, according to the Catalan Institute of Oncology. HPV infection is more persistent in older women who are over 30 years, than in younger women [18,19,20,12,21,22].

Nigeria has almost 47 million females who are at risk of developing HPV, with an estimated 14,089 diagnosed with Cervical Cancer annually and 8,240 fatalities. In Nigeria, it is approximated that around 32% of women with normal cytology living in the six geopolitical regions have cervical HPV infection [6,14,23]. Young women are among the most vulnerable to HPV and other illnesses, with advancing age, the occurrence tends to diminish. Precancerous lesions and cervical cancer are accelerated by the tenacity of oncogenic HPV strains, and high viral load. Other factors, including genetics, sexual behaviour, and immunity, may influence the emergence of cancer [9,19,1,24].

Several risk factors for HPV contagion and persistence in women have already been identified. These risk factors include concomitance with several STI such as herpes simplex, Chlamydia trachomatis, and gonorrhoea, continuous use of oral contraceptives, immunological impairment, high parity, smoking tobacco, pregnancy at a tender age, and most common is the presence of HIV infection [25,26,27]. HIV-positive women have a greater frequency of HPV contagion, including

high-risk carcinogenic multiple infections. When compared with the general populace, HIV-induced immunosuppression raises the risk of acquiring squamous intraepithelial lesions. Patients who are immunocompromised due to HIV infection would have a bigger frequency and tenacity of HPV lesions [28,1,28,21].

However, HPV DNA testing, HPV vaccination, the traditional Pap test, liquid-based cytology, and visual inspection are all suggested preventative measures for women. HPV DNA analysis has emerged as a recognized substitute for cytology. It has a high level of precision in deciding who is at risk of being infected with cervical cancer [29,30,31].

HIV-infected females are more likely to contact chronic oncogenic HPV infection. HPV causes cervical intraepithelial neoplasia and malignancies which includes cervical, vaginal, anal, penile, vulva, as well as head and neck cancer [30,1,23]. The number of women at risk of developing cervical cancer in Nigeria is projected to be 50.3 million, with 8,240 fatalities related to the disease [14].

There is limited data on prevalence of HPV and associated factors among HIV-positive women in Minna, Niger state. There is a need to evaluate the prevalence of HPV, its genotype distributions, knowledge, and attitude among HIV-positive women attending prenatal clinics in Minna, Niger State. This study therefore intends to fill these gaps and provide valuable insights into data on prevalence of HPV and associated factors among HIV positive women in Minna, Niger state. The findings could inform public health policymakers, and healthcare service providers on how to develop strategic programs tailored to this vulnerable population, ultimately towards reducing the burden of cervical cancer in the region.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Minna Niger state Nigeria. Minna is a city in Middle Belt Nigeria with a population of 496,000. It is the capital of Niger State in Nigeria. Its geographical coordinates are 9° 35' 0.7980" N and 6° 32' 46.7376" E, respectively. The state is bounded by the Niger to the south, bordered on the north by Zamfara and Kebbi state, to the north and northeast by Kaduna state, to the southeast by

Kogi state, and to the south by Kwara state. Niger state's eastern boundary is the Federal Capital Territory of Abuja, and its western border is the Republic of Benin. The area is largely made up of woodland savannas and includes the Kaduna River flood plains. The demographic makeup of the region encompasses a variety of professions, including farmers, civil servants, artisans, and fishermen. While the area boasts a number of community health centres, the presence of major health facilities is relatively scarce.

2.2 Inclusion Criteria

Persons with an established HIV diagnosis who attended a gynaecological appointment to do routine cytology in the Minna General Hospital, Niger State HIV outpatient program was eligible to take part in the study. Participants were those over the age of 18, who consented by signing the consent form, and were not pregnant, and did not have a contraindication for Pap smear examination (for example, current usage of vaginal ovules, menstruation, or vaginal clean-up in the previous 24 hours). These criteria were designed to enable a focused investigation into the gynaecological health and cervical cancer screening of HIV-positive individuals, ensuring ethical and methodological rigor.

2.3 Sample Size Determination

The sample size for this study was determined using the formula: $n = \frac{P(1-P)t^2}{M^2}$ Where: n = the desired sample size; t = confidence interval at 95% (standard value of 1.96). p = prevalence rate, a prevalence of = 0.124 (12.4%) was be used.

m = marginal error at 5% (standard value of 0.05)

$$n = (0.124(1 - 0.124)1.96^2) \div 0.05^2$$

$$n = 166.9$$

n = Approximately 167

2.4 Data and Sample Collection

A specially structured questionnaire was used to collect data on demographic information: Age, occupation, education, religion, marital status, previous pregnancy, and number of pregnancies. age of pregnancy, knowledge about HPV, attitudes towards treatment, transmission routes, risk factors, and methods of prevention and control.

2.5 HPV Testing

An in-house (hospital laboratory) Riatol quantitative polymerase chain reaction (qPCR) HPV genotyping system was employed for HPV testing. The procedure was performed according to the manufacturer's instructions. The HPV test report was grouped into: Low-risk HPV types which include types 6, 11, 42, 43, and 44, while High-risk HPV types include types 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68, and 70. Results were reported as high-risk HPV (HrHPV) or low risk HPV (LrHPV) negative, HrHPV or LrHPV positive or invalid. A sample was considered analytically HPV negative if none of the HrHPV or LrHPV tests showed a positive signal and the beta-globin DNA concentration was above 0.12ng/ μ L. HPV positivity was defined using clinically optimized cut-offs (i.e., log₁₀ of the viral concentration is above 6.493 copies/mL).⁹ Invalid samples with a human DNA concentration below 0.12ng/ μ L were excluded from the statistical analysis.

2.6 Data Analysis

The Statistical Package for Social Sciences (SPSS) version 23.0, IBM Corp., Armonk, NY, USA, was used to analyze the data. SPSS was chosen for data analysis due to its user-friendly interface, comprehensive statistical capabilities, data visualization tools, and compatibility with medical research, as well as its established reputation and strong support resources. These factors collectively make SPSS a reliable and effective choice for analyzing the data in the context of this study. Descriptive statistics were used for all relevant data and presented in tables or charts as percentages and frequencies. Continuous variables with normally distributed distributions were represented as mean standard deviation (SD).

The prevalence was calculated as a measure of frequency. The scores for knowledge and attitude responses to the questionnaire were determined using the method developed by [4]. Every correctly answered question received a point, whereas any incorrectly or inappropriately answered question received 0 points. These scores were combined to calculate the cumulative score for HIV-infected women's

knowledge and attitude concerning HPV. A score > 4 was considered good, while a score < 4 was considered poor.

Knowledge variables were dichotomized into "good" and "poor" depending on the cut off criteria given above. Chi square and student T test were used to compare categorical variables and continuous variables respectively. To test the level of significance P was set at α value \leq 0.05.

3. RESULTS

3.1 Socio-Demographic and Socio-Economic Features of Participants

Table 1 shows the features of the participants. Out of the 250 questionnaires shared to women who attended gynecological appointment, only 162 were not pregnant and did not indicate a contraindication for pap smear. These 162 females were used for the study, representing a 98% response rate when compared with the desired sample size (n) of 167. The mean age of the participants was 34.42 ± 8.56 years. The youngest and oldest ages recorded among the participants were 20 and 58 years respectively. Majority of the participants (66/162, 41%) were between the age brackets of 20 to 29 years of age. Sixty five percent of the participants (105/162) were living with partners (either married or cohabiting) and 54% of them (87/162) were Muslims.

Majority of the participants obtained senior secondary education (53/162, 33%) as their highest qualification and most had trading as their occupation (55/162, 34%).

With reference to the risk behaviors which can predispose them to acquiring HPV, more than half of the participants had their first sexual intercourse after 18 years of age (106/162, 65%). In addition, most of the participants have had more than one sexual partner in their lifetime (155/162, 96%), never smoked before (143/162, 88%), have used contraceptives (84/162, 52%) and also have had previous record of pregnancies (148/162, 91%).

Table 1. Characteristics of the target participants (n = 162)

| Variables | Categories | Frequency | Percentage | Mean±SD |
|---|---------------------|-----------|------------|------------|
| Demographic information | | | | |
| Age (years) | 20 – 29 | 66 | 40.7 | 34.42±8.56 |
| | 30 – 39 | 58 | 35.8 | |
| | 40 – 49 | 35 | 21.6 | |
| | >49 | 3 | 1.9 | |
| Religion | Christian | 75 | 46 | |
| | Muslim | 87 | 54 | |
| Marital status | Single | 45 | 28 | |
| | Married | 83 | 51 | |
| | Widowed | 8 | 5 | |
| | Cohabiting | 22 | 14 | |
| | Divorced | 4 | 2 | |
| Occupation | House wife | 40 | 25 | |
| | Student | 26 | 16 | |
| | Trader | 55 | 34 | |
| | Farmer | 15 | 9 | |
| | Civil servant | 18 | 11 | |
| | Retired | 8 | 5 | |
| Educational qualification | No formal education | 24 | 15 | |
| | Primary | 32 | 20 | |
| | Junior Secondary | 30 | 19 | |
| | Senior Secondary | 53 | 33 | |
| | Tertiary | 23 | 14 | |
| HPV risk factors | | | | |
| Age at first sexual intercourse (years) | <18 | 56 | 35 | |
| | ≥18 | 106 | 65 | |
| Number of lifetime sexual partners | 1 | 7 | 4 | |
| | 2 | 25 | 15 | |
| | 3 | 48 | 30 | |
| | 4 | 30 | 19 | |
| Alcohol consumption | ≥5 | 52 | 32 | |
| | None | 98 | 60 | |
| | Often | 38 | 23 | |
| Smoking behaviour | Occasional | 28 | 17 | |
| | Never | 143 | 88 | |
| Use of contraceptives | Ever | 19 | 18 | |
| | Never used | 78 | 48 | |
| | Ever used | 84 | 52 | |
| Any record of past pregnancies | Yes | 148 | 91 | |
| | No | 14 | 9 | |

Table 2. HPV results of HIV patients age ≥18 years who attend gynaecological appointment for routine cytology in Minna General Hospital Niger State

| HPV test result | Frequency | Percentage |
|-----------------|-----------|------------|
| Positive | | |
| HrHPV | 66 | 41 |
| LrHPV | 54 | 33 |
| HPV Negative | 23 | 14 |
| NE | 19 | 18 |
| Total | 162 | 100 |

Abbreviations: Human papillomavirus (HPV); High-risk human papillomavirus (HrHPV); Low-risk human papillomavirus (LrHPV); Not evaluable (NE)

3.2 Prevalence of HPV within the Study Population

As indicated in Table 2, out of the 162 samples collected, 120 samples (74%) were positive for HPV, 23 (14%) of the participants tested negative and 19 (18%) could not be evaluated possibly due to insufficient concentration of DNA in the samples. Regarding the positive samples, 66 (41%) of them were HrHPV positive while 54 (33%) were LrHPV.

3.3 Knowledge of HPV among Women Infected with HIV

Table 3 shows the participants knowledge of HPV infection. With regards to the knowledge of

HPV infection, only 125 (77%) of the participants have previously heard of HPV infection with 7 (4%) being aware of the conventional pap smear screening tool. Within the past 5 years, only 6% of the participants have ever been screened for HPV infection. In response to the question as to whether HPV can be contracted through unprotected sexual intercourse, only 10% of the participants were aware, 72% were not aware and 18% had no idea. Furthermore, only 5% of the participants were aware of the existence of HPV vaccines.

In table 4 the media (91/125, 77%) was the most common source of information amongst the respondents who have heard of HPV followed by health professionals (24/125, 19%) (Table 4).

Table 3. Participants' knowledge of HPV

| S/N | Item | Frequency | Percent |
|-----|--|-----------|----------|
| 1. | Have you ever heard of human papillomavirus (HPV) infection? | | |
| | Yes | 125 | 77 |
| | No | 37 | 23 |
| 2. | Have you heard of cervical cancer? | | |
| | Yes | 154 | |
| | No | 8 | 95 5 |
| 3. | Are you aware that cervical cancer can be caused by HPV? | | |
| | Yes | 18 | 11 |
| | No | 144 | 89 |
| 4. | Are you aware that HPV can be contracted through unprotected sexual intercourse? | | |
| | Yes | | |
| | No | 16 | 10 |
| | No idea | 117 29 | 72 18 |
| 5. | Are you aware that HIV can predispose an individual to HPV infection? | | |
| | Yes | 15 | 9 |
| | No | 147 | 91 |
| 6. | Are you aware of any HPV screening tool in Nigeria? | | |
| | None | | |
| | Pap smear/others | 155 7 | 96 4 |
| 7. | Do you know HPV as an infection? | | |
| | Yes | | |
| | No | 20 142 | 12 88 |
| 8. | Are you aware of the existence of HPV vaccines? | | |
| | Yes | 7 | 4 |
| | No | 155 | 96 |

Table 4. Sources of information about the existence of HPV

| Source | Number | Percentage |
|----------------------|--------|------------|
| Health professionals | 24 | 19 |
| Media | 91 | 73 |
| Family and relatives | 2 | 2 |
| Friends | 8 | 6 |

Table 5. Attitudes of participants to HPV screening

| Factor | Number | Percentage |
|---|--------|------------|
| Have you ever screened for HPV within the last 5 years? | | |
| Yes | | |
| No | 98 | 60 |
| | 64 | 40 |
| If yes, were you informed of the results? | 72 | 73 |
| Are you willing to undertake routine HPV if you collect the samples yourself? | | |
| Yes | 122 | 75 |
| No | 28 | 17 |
| Not sure | 12 | 7 |
| Do you know about pap smear in HPV screening? | 49 | 30 |
| Reasons while you have not yet gone for a pap smear? | | |
| Not aware of it | | |
| Bad attitude of the nurses | 48 | 75 |
| Fear of the procedure involved | - | - |
| It's too expensive | 9 | 14 |
| Discouraged by partner | - | - |
| Religious/cultural reasons | 1 | 2 |
| It is not necessary | 3 | 5 |
| | 3 | 5 |

3.4 Attitudes of HIV Infected Women to HPV Screening

Table 5 shows the attitude of the participants to HPV screening. Out of the 162 participants that were involved in the study, 98 (60%) have undergone HPV screening within the last five (5) years. 122 (75%) participants were willing to undergo routine HPV screening if they can collect the samples themselves. Majority of the participants (155/162, 96%) were not aware of the pap smear method used in HPV screening and have not gone for such screening due to different reasons.

4. DISCUSSION

Human Papillomavirus (HPV) is a common sexually transmitted infection that has seriously complicated the health status of HIV-positive women, especially in third-world countries where improved health care is lacking. This study sheds light on the prevalence of HPV, knowledge, and the attitudes of HIV-positive

women towards infection and vaccine access in Minna, Niger State. The current study found 74 % cases of HPV, made up of 41% of High risk and 33% Low risk types. This is in line with previous reports of [18,12,21] who observed 73% HPV prevalence in the Northwest part of Nigeria. The high prevalence observed in this report might be related to a lack of awareness about the transmission route of the causative organism. From our findings, only 10% of study participants were unaware of unprotected sexual contact as one of the primary modes of HPV transmission emphasizing the need for better dissemination of information regarding HPV prevention. This finding echoes concerns raised in previous research about the lack of knowledge about HPV transmission modes [28] It underscores the importance of addressing these gaps through targeted education efforts to reduce the risk of HPV transmission and related health consequences among this population. Level of Education also influenced the distribution of the infection among the participants. Respondents with a lower educational level were linked to a

poorer understanding of HPV infection routes. Prior research has linked inadequate education to a lack of awareness about HPV worldwide [32], [33]. Of those surveyed, 77% were aware of HPV, but only 11% were aware of its link to cervical cancer. Women with at least a high school education and those who regularly had Pap tests performed were more likely to be knowledgeable about HPV. Ten per cent of participants in this study who had their knowledge of HPV assessed were not aware that unprotected sexual contact is one of the main ways that HPV infections are spread.

The fact that only 11% of those surveyed in the current study were aware of the link between HPV and cervical cancer underscores the urgent need for comprehensive education campaigns. This finding resonates with other literature on HPV awareness and its connection to cervical cancer. Adequate education can be a powerful tool in preventing HPV-related diseases, and the low awareness observed in this study highlights the existing knowledge gaps among the target population, reflecting the need for targeted educational interventions [34,2,32,35].

Furthermore, the association between educational attainment and knowledge about HPV, as well as the role of regular Pap tests in enhancing awareness, aligns with previous research. These factors have consistently been identified as key determinants of HPV knowledge [30]. This underscores the significance of promoting educational initiatives and regular screening as part of a comprehensive public health strategy to improve HPV awareness and prevention, particularly among HIV-positive women.

5. CONCLUSION

The study's findings demonstrate that HIV-positive women who underwent routine cervical cancer screening at Minna General Hospital in Niger State are aware of the existence of the disease but knew very little about HPV infection, and whether vaccines were available. It is implied that these women might not be motivated to engage in preventive measures like HPV testing and vaccinations, or to stop engaging in behaviors that make them more susceptible to the illness. Enlightenment campaigns must thus be launched to solve this knowledge gap; women must be aware that HPV vaccines are available. Since HPV is a major cause of cervical cancer,

the struggle to eradicate it won't even be half over until this is done.

6. RECOMMENDATIONS FOR FURTHER STUDY

It is imperative to acknowledge that these findings raise questions about the effectiveness of public health education programs and the need for improved dissemination of information regarding HPV and its connection to cervical cancer among this population. To gain a deeper understanding of these knowledge gaps and their implications, further research should explore the reasons behind these disparities, possibly through qualitative interviews or surveys. Additionally, the study should be situated within the broader context of public health campaigns and educational initiatives targeting HPV awareness and prevention among HIV-positive women in similar settings, emphasizing the importance of vaccination and routine screenings.

CONSENT AND ETHICAL APPROVAL

Ethical approval for this study was obtained from Ministry of Health Minna, Niger state. Each participant signed the consent form before they take part in the study, Participation was voluntary, and participants was informed of the option to opt out at any time without penalty.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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