

Knowledge and Awareness of Human Papillomavirus Infection and Cervical Cancer Prevention among Female Undergraduate Students in Jos, Nigeria

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ABSTRACT

Background and Objectives: Human papillomavirus (HPV) is a prevalent sexually transmitted infection, strongly linked to cervical cancer, a leading cause of cancer-related mortality among women globally, particularly in low- and middle-income countries. This cross-sectional study aimed to assess the knowledge of female undergraduate students at the University of Jos, Nigeria, regarding HPV, cervical cancer, and their prevention.

Materials and Methods: A multi-stage sampling method was employed to select 350 participants, and data were collected using a structured questionnaire covering socio-demographic information, knowledge of HPV infection, its risk factors and prevention, and knowledge of cervical cancer, screening, and prevention.

Results: The findings revealed a low level of HPV awareness, with 72% of respondents never having heard of HPV prior to the study. Knowledge of HPV risk factors (53 %) and prevention (50.6 %) was moderate, while knowledge of cervical cancer was poor (49.9%), its risk factors (38.4 %), individual risk factors (43 %), early symptoms (28.9 %), prevention (49.7 %), and screening (29.7 %) was poor.

Conclusion: These results underscore a critical need for enhanced educational interventions focusing on HPV infection, its causal link to cervical cancer, and available preventive measures, including vaccination, to improve knowledge and uptake of preventive services among university students in Nigeria.

Keywords: Human papillomavirus, cervical cancer, knowledge, risk factors, prevention, Screening

INTRODUCTION

Cervical cancer remains one of the most significant causes of cancer-related morbidity and mortality among women worldwide. Although considerable progress has been made in the prevention and management of the disease, it continues to pose a major public health challenge, particularly in low- and middle-income countries where access to preventive and curative healthcare services remains inadequate. Approximately 90% of cervical cancer cases and deaths occur in these countries, highlighting substantial global inequalities in women's health outcomes¹.

Human papillomavirus (HPV) is a common sexually transmitted infection and is recognized as the primary cause of cervical cancer. Persistent infection with high-risk HPV types is responsible for the development of the vast majority of cervical cancer cases². Beyond cervical cancer, HPV infection has also been implicated in the development of several other malignancies, including cancers of the anus, vulva, vagina, penis, and oropharynx¹. The availability of effective HPV vaccines and cervical cancer screening methods provides important

opportunities for reducing the burden of HPV-related diseases; however, awareness and utilization of these preventive measures remain low in many developing countries¹.

The burden of cervical cancer is disproportionately concentrated in resource-limited settings. Recent estimates indicate that hundreds of thousands of women develop cervical cancer annually, with the highest incidence and mortality rates occurring in sub-Saharan Africa and other low-resource regions³. Inadequate access to HPV vaccination, screening programmes, early diagnosis, and treatment services contributes substantially to the continued high burden of disease in these settings^{3,4}. Consequently, women living in low- and middle-income countries face a significantly greater lifetime risk of developing cervical cancer than women in more developed regions of the world⁵.

In Nigeria, cervical cancer remains a major reproductive health concern. Previous studies have documented poor knowledge of cervical cancer risk factors, symptoms, preventive measures, and screening services among women^{5,6}. Limited awareness of HPV infection has also been reported, with many women lacking knowledge of its role in the development of cervical cancer⁵. Inadequate knowledge of HPV and cervical cancer may contribute to poor uptake of preventive services such as HPV vaccination and cervical cancer screening, thereby increasing the likelihood of late diagnosis and poor health outcomes.

Young women attending tertiary institutions constitute an important population for cervical cancer prevention initiatives. Many university students are within the age group during which HPV infection is commonly acquired, making early education and preventive interventions particularly important. Adequate knowledge of HPV infection, cervical cancer risk factors, and available preventive measures is essential for informed health decisions and the adoption of preventive behaviours. Assessing the level of awareness and knowledge among university students can therefore provide valuable information for the development of targeted health education programmes aimed at reducing the future burden of cervical cancer.

Therefore, this study assessed the knowledge and awareness of HPV infection, cervical cancer, and their prevention among female undergraduate students at the University of Jos, Nigeria. The findings are expected to provide evidence that can support the design and implementation of effective educational and public health interventions targeted at improving awareness, prevention practices, and utilization of cervical cancer prevention services among young women.

MATERIALS AND METHODS

The study was carried out at Jos-Plateau State, Nigeria at the University of Jos. The study design was Cross sectional and was designed to find the level of knowledge and prevention of HPV as a risk factor of cervical cancer among the undergraduate students. The study took university of Jos undergraduate students as the target population.

The sample size of the study was determined by the single population proportion formula and taking into consideration the prevalence of 66.9% of HPV-related cervical cancer in Nigeria, 95% confidence interval (CI), 5% margin of error and 10% non-response rate to give a sample size of 370⁷.

$$n = \frac{Z^2 \times P \times (1 - P)}{d^2}$$

$$d^2$$

Where

n = desired sample size

z = standard normal deviation usually set at 1.96

p = 66.9% prevalence of Hpv related cervical cancer in Nigeria.

$q = 1 - P$ (complementary probability)

d = absolute precision or error tolerated = 5%

$$n = \frac{Z^2 \times P \times (1 - P)}{d^2}$$

$$d^2$$

$$n = \frac{1.96^2 \times 0.67 \times (1 - 0.67)}{0.05^2}$$

$$0.05^2$$

$$n = \frac{3.8416 \times 0.67 \times 0.33}{0.0025}$$

$$0.0025$$

$$n = \frac{0.85}{0.0025}$$

$$0.0025$$

$$n = 340$$

After considering a 10% non-response, $n = 370$

$$N = 370$$

Multi-stage sampling technique was used to select the faculties and departments. The sampling technique was systematic sampling method from each level.

The data obtained from the study respondents were obtained through structured self-administered questionnaire. Participants were eligible for inclusion in the study if they were willing to participate and were attending one of the selected schools. Those who were unwilling to participate, were seriously ill, or were absent from school at the time of data collection were excluded from the study.

The ethical committee of Jos University Teaching Hospital was contacted and ethical clearance was requested and received. Data from all this study were analyzed statistically by using the Statistical Packages for Social Sciences (SPSS) version 25. The data were analyzed descriptively with frequency distribution and percentages.

To determine the knowledge scores, one point was given for each correct answer and zero points were given for each incorrect answer and each “Don't Know” answer. The percentage scores were computed for every respondent. The level of knowledge was divided into three groups: good (70% and above), moderate (50–69%) and poor (<50%)⁸.

RESULTS

Sociodemographic Characteristics

A total of 350 female undergraduate students participated in the study. Most respondents were aged 21–25 years (58.6%), Christians (78.0%), and unmarried (90.3%). Nearly half (49.4%) had ever engaged in sexual intercourse, with most reporting sexual debut between 18 and 20 years of age (54.0%) (Table 1).

Table 1: Sociodemographic Characteristics of the Respondents (N=350)

Variables	Frequency (n)	Percentage (%)
Age: 16–20	135	38.6

Age: 21–25	205	58.6
Age: 26–30	10	2.9
Religion: Christian	273	78.0
Religion: Muslim	72	20.6
Religion: Protestant	5	1.4
Educational Level: 100L	83	23.7
Educational Level: 200L	102	29.1
Educational Level: 300L	152	43.4
Educational Level: 400L	13	3.7
Marital Status: Married	34	9.7
Marital Status: Not Married	316	90.3
Parity: Never had children	333	95.1
Parity: Had one or more children	17	4.9
Sexual Activity: Ever had sex	173	49.4
Sexual Activity: Never had sex	177	50.6
Age at First Sex (13–17)	31	24.3
Age at First Sex (18–20)	70	54.0
Age at First Sex (21–30)	28	21.7

Awareness and Knowledge of HPV Infection

Only 28.0% of respondents had heard of HPV before the study, while 72.0% had never heard of it. Although 64.3% correctly identified sexual intercourse as a route of transmission, only 50.6% knew HPV is preventable (Table 2).

Table 2: General Knowledge and Awareness of HPV Infection (N=350)

Variable	Yes n (%)	No n (%)	No Idea n (%)
Heard of HPV before today	98 (28.0)	252 (72.0)	—
HPV is caused by unprotected sex	50 (14.3)	—	291 (83.1)
HPV is transmitted through sexual intercourse	225 (64.3)	—	103 (29.4)
HPV is curable	76 (21.7)	265 (75.7)	5 (1.4)
HPV is preventable	177 (50.6)	4 (1.1)	169 (48.3)

Knowledge of HPV Risk Factors and Prevention

The overall knowledge score for HPV risk factors and prevention was 53.0%, indicating moderate knowledge. Respondents were most knowledgeable about HPV screening (73.9%) and the increased risk associated with multiple sexual partners (71.3%), whereas awareness that HPV is the main cause of cervical cancer was low (36.9%) (Table 3).

Table 3. Knowledge of HPV Risk Factors and Prevention among Respondents (N = 350)

Statement	Correct n (%)	Incorrect n (%)	Don't Know n (%)	Score (%)
HPV is the main cause of cervical cancer	102 (29.1)	26 (7.4)	222 (63.4)	36.9
Women should be screened for HPV	229 (65.4)	0 (0.0)	121 (34.6)	73.9
HPV is the main cause of genital warts	114 (32.6)	39 (11.1)	197 (56.3)	44.1
Multiple sexual partners increase HPV risk	215 (61.4)	10 (2.9)	125 (35.7)	71.3
Early sexual debut increases HPV risk	108 (30.9)	41 (11.7)	201 (57.4)	42.2
HPV can persist in the body for a long time	108 (30.9)	4 (1.1)	236 (67.4)	40.5

HPV can cause anal, vulvar, vaginal, and penile cancers	149 (42.6)	5 (1.4)	196 (56.0)	52.9
HPV is a sexually transmitted infection	207 (59.1)	18 (5.1)	125 (35.7)	69.9
HPV vaccination protects against HPV infection	140 (40.0)	9 (2.6)	201 (57.4)	50.5
HPV testing is available	100 (28.6)	14 (4.0)	236 (67.4)	38.2
Condom use provides partial protection against HPV	178 (50.9)	21 (6.0)	151 (43.1)	62.3
Overall Knowledge Score				53.0

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge.

Knowledge of Cervical Cancer

The overall knowledge score for cervical cancer was poor (49.9%). While 71.1% correctly identified cervical cancer as a disease of the cervix, only 28.7% recognized HPV as its primary cause (Table 4).

Table 4: Total Knowledge on Cervical Cancer (N=350)

Knowledge Item	True/Yes n (%)	False/No n (%)	Unsure n (%)	Correct Score (%)
Have you ever heard of cervical cancer?	179 (51.1)*	133 (38.0)	38 (10.9)	72.0
Cervical cancer is a cancer arising from the cervix	212 (60.6)*	9 (2.6)	125 (35.7)	71.1
Teenagers who are sexually active from a young age are at risk of developing cervical cancer	105 (30.0)*	56 (16.0)	181 (51.7)	42.9
HPV is the main cause of cervical cancer	71 (20.3)*	21 (6.0)	254 (72.6)	28.7
All females can acquire cervical cancer	78 (22.3)*	98 (28.0)	169 (48.3)	34.9
Overall Knowledge Score				49.9

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge.

Knowledge of Cervical Cancer Risk Factors

Knowledge of cervical cancer risk factors was poor, with an overall score of 38.4%. Multiple sexual partners (69.4%) and sexually transmitted diseases (57.8%) were the most commonly identified risk factors, although several misconceptions were observed (Table 5).

Table 5 Knowledge of Risk Factors for Cervical Cancer (N = 350)

Risk Factor	Agree n (%)	Disagree n (%)	Unsure n (%)	Correct Score (%)
Sexually transmitted diseases	160 (45.7)*	29 (8.3)	161 (46.0)	57.8
Multiple sexual partners	207 (59.1)*	12 (3.4)	131 (37.4)	69.4
Unhygienic toilet seats	152 (43.4)	37 (10.6)*	161 (46.0)	19.0
Drinking dirty water	35 (10.0)	107 (30.6)*	208 (59.4)	41.6
Blood transfusions	85 (25.4)	85 (24.3)*	176 (50.3)	36.8
Drinking alcohol	33 (9.4)*	142 (40.6)	175 (50.0)	16.8
Smoking cigarettes	62 (17.7)*	121 (34.6)	167 (47.7)	29.0
Urinary tract infection	153 (43.7)*	31 (8.9)	166 (47.4)	55.8

Cervical cancer is heritable	51 (14.6)	88 (25.1)*	211 (60.3)	35.8
Eating a high-fat diet	22 (6.3)	107 (30.6)*	221 (63.1)	40.9
Using birth control pills	45 (12.9)*	69 (19.7)	236 (67.4)	19.9
Overall Knowledge Score				38.4

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge.

Knowledge of Individuals at Risk

The overall knowledge score regarding individuals at risk of cervical cancer was 43.0%. More than half of respondents correctly identified women with unprotected sexual intercourse (55.8%) and multiple sexual partners (55.3%) as high-risk groups (Table 6).

Table 6 : Knowledge of Individuals at Risk of Cervical Cancer (N = 350)

High-Risk Group	Agree n (%)	Disagree n (%)	Unsure n (%)	Correct Score (%)
HIV-positive women	82 (23.4)*	47 (13.4)	221 (63.1)	33.5
Women who have unprotected sex	155 (44.3)*	22 (6.3)	173 (49.4)	55.8
Sexually active women	137 (39.1)*	44 (12.6)	169 (48.3)	51.8
Women on contraceptives	41 (11.7)	70 (20.0)*	239 (68.3)	28.9
Women not on antibiotics	57 (16.3)	79 (22.6)*	214 (61.1)	32.8
Women with more than one sexual partner	149 (42.6)*	41 (11.7)	160 (45.7)	55.3
Overall Knowledge Score				43.0

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge.

Knowledge of Early Symptoms

Knowledge of early symptoms of cervical cancer was poor, with an overall score of 28.9%. Offensive vaginal discharge was the most frequently recognized symptom (49.4%), while awareness of other symptoms was generally low (Table 7).

Table 7: General Knowledge of Early Symptoms of Cervical Cancer (N = 350)

Knowledge Item	Agree n (%)	Disagree n (%)	Unsure n (%)	Correct Score (%)
Offensive vaginal discharge	133 (38.0)*	25 (7.1)	192 (54.9)	49.4
Bleeding after sexual intercourse	85 (24.3)*	21 (6.0)	244 (69.7)	33.4
Pain during menstruation	81 (23.1)	61 (17.4)*	208 (59.4)	26.9
Heavy menstrual bleeding	82 (23.4)*	22 (6.3)	246 (70.3)	32.4
There may be no symptoms	38 (10.9)*	69 (19.7)	243 (69.4)	17.0
Rash in the vaginal area	131 (37.4)	3 (0.9)*	216 (61.7)	1.6
Swelling in the vaginal area	110 (31.4)*	24 (6.9)	216 (61.7)	42.0
Overall Knowledge Score				28.9

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge

Knowledge of Prevention

The overall knowledge score for cervical cancer prevention was 49.7%. Regular screening (67.6%), HPV vaccination (61.4%), and condom use (56.7%) were the most commonly recognized preventive measures (Table 8).

Table 8: General Knowledge of Cervical Cancer Prevention (N = 350)

Knowledge Item	Agree n (%)	Disagree n (%)	Unsure n (%)	Correct Score (%)
Condoms	153 (43.7)*	43 (12.3)	154 (44.0)	56.7
HPV vaccine	178 (50.8)*	8 (2.3)	164 (46.9)	61.4
Contraceptives	38 (10.8)	99 (28.3)*	213 (60.9)	39.0
Antibiotics	128 (36.6)	42 (12.0)*	180 (51.4)	23.9
Regular screening tests	198 (56.6)*	19 (5.4)	133 (38.0)	67.6
Overall Knowledge Score				49.7

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge

Knowledge of Screening

Knowledge of cervical cancer screening was poor (29.7%). Only 1.1% of respondents had ever undergone screening, and 7.4% had heard of the Pap smear test (Table 9).

Table 9 : General Knowledge of Cervical Cancer Screening (N = 350)

Knowledge Item	True/Yes n (%)	False/No n (%)	Unsure n (%)	Correct Score (%)
Have you ever undergone cervical cancer screening?	4 (1.1)	312 (89.1)	34 (9.7)	–
Have you ever heard of a Pap smear test?	26 (7.4)	266 (76.0)	58 (16.6)	–
Pap smear should be carried out at least every 2 years for eligible women	51 (12.0)*	29 (8.3)	270 (77.1)	21.2
Cervical cancer is screened using a Pap smear test	72 (20.6)*	5 (1.4)	273 (78.0)	28.2
HPV vaccine can protect against cervical cancer	92 (26.3)*	5 (1.4)	253 (72.3)	35.2
HPV vaccine is recommended for adolescent girls before first sexual activity	87 (24.8)*	20 (5.7)	243 (69.4)	34.0
Overall Knowledge Score				29.7

*Note: Correct responses are marked with an asterisk. Interpretation: $\geq 70\%$ = Excellent knowledge; $\geq 50\%$ to $< 70\%$ = Moderate knowledge; $< 50\%$ = Poor knowledge.

DISCUSSION AND CONCLUSION

Discussion

This study assessed the level of knowledge and awareness of HPV infection and cervical cancer among female undergraduate students at the University of Jos, Nigeria. The findings revealed considerable deficiencies in

awareness and understanding of HPV infection, cervical cancer, their risk factors, symptoms, prevention methods, and screening services despite the relatively high educational status of the respondents.

Awareness of HPV among the respondents was low, with only 28.0% reporting that they had heard of HPV before participating in the study. The low awareness observed may reflect the limited integration of HPV education into university health promotion programmes and the absence of routine national HPV vaccination campaigns in Nigeria. In addition, discussions surrounding sexual health remain culturally sensitive, potentially reducing opportunities for young women to obtain accurate information before becoming sexually active. This finding is consistent with previous studies conducted in Nigeria, which reported inadequate awareness of HPV and cervical cancer among women and young adults^{9,10}. Similar findings have also been reported among female university students in Ethiopia, where knowledge of HPV infection and its association with cervical cancer was found to be limited¹¹. Low awareness of HPV may negatively influence the adoption of preventive practices such as vaccination, safe sexual behaviour, and participation in screening programmes.^{11,12}

The overall level of knowledge regarding HPV risk factors and prevention was moderate. Respondents demonstrated some understanding of the role of multiple sexual partners in HPV transmission and recognized the importance of HPV screening. However, knowledge of the causal relationship between HPV and cervical cancer remained poor, as only a small proportion correctly identified HPV as the primary cause of cervical cancer. Similar findings have been reported among Ethiopian university students, where awareness of HPV as the major cause of cervical cancer was also low¹¹. Comparable deficiencies in HPV-related knowledge have been documented among female university students in Ghana¹³. These findings indicate that important gaps remain in students' understanding of HPV-related diseases.

Knowledge of cervical cancer was generally poor. Although many respondents correctly identified cervical cancer as a disease affecting the cervix, less than one-third recognized HPV infection as its principal cause. This apparent discrepancy suggests that respondents may possess fragmented knowledge acquired from general sexual health education without recognizing HPV by name or understanding its role in cervical carcinogenesis. Similar observations have been reported among female students in Ethiopia and Ghana, where limited knowledge of cervical cancer etiology remains a significant public health concern^{11,13}. The findings suggest that while awareness of cervical cancer as a health problem may be increasing, understanding of its causes and preventive measures remains inadequate.

Knowledge of cervical cancer risk factors was also poor. While sexually transmitted infections and multiple sexual partners were correctly identified by many respondents as risk factors, several misconceptions were observed. A substantial proportion of respondents incorrectly associated cervical cancer with unhygienic toilet seats, dirty water, and blood transfusion. Similar misconceptions have been reported among women in Nigeria and other African settings.¹⁴ Such misconceptions may contribute to poor risk perception and reduce engagement in evidence-based preventive practices.^{14,15}

The study further demonstrated poor knowledge of individuals at increased risk of developing cervical cancer. Although respondents generally recognized women with multiple sexual partners and those engaging in unprotected sexual intercourse as being at increased risk, awareness of the vulnerability of women living with HIV was limited. This finding is important because HIV infection has been shown to increase the likelihood of persistent HPV infection and subsequent progression to cervical cancer¹. Greater awareness of this relationship is necessary, particularly in sub-Saharan Africa where both HIV infection and cervical cancer continue to pose significant public health challenges.

The poorest level of knowledge observed in this study related to the early symptoms of cervical cancer. Less than half of the respondents identified offensive vaginal discharge as a warning sign, while awareness of postcoital bleeding and asymptomatic disease was particularly low. Similar findings have been reported among women in Nigeria and Ethiopia, where poor recognition of cervical cancer symptoms has been identified as a barrier to early diagnosis and treatment^{9,11}. Inadequate knowledge of symptoms may delay healthcare-seeking behaviour and contribute to late presentation when treatment outcomes are less favourable.

Knowledge of cervical cancer prevention was also inadequate. Although many respondents identified HPV vaccination, condom use, and regular screening as preventive measures, considerable uncertainty remained regarding cervical cancer prevention. Similar findings have been reported among female university students in Ghana and Ethiopia, where awareness of preventive strategies was moderate but utilization remained low^{11,13}. These findings highlight the need for comprehensive educational interventions that emphasize HPV vaccination, safer sexual practices, and routine screening as effective prevention strategies.

Knowledge and utilization of cervical cancer screening services were particularly poor among the respondents. Only a very small proportion had ever undergone cervical cancer screening, and awareness of the Pap smear test was extremely low. Similar patterns of poor screening uptake have been reported among women in Nigeria, Ghana, and Ethiopia despite the availability of effective screening methods^{9,11,13}. Evidence from Nigeria also suggests that uptake of HPV vaccination remains low among eligible populations¹⁶. The low screening rates observed in this study may be related to inadequate awareness, perceived low susceptibility to cervical cancer, financial barriers, and limited access to screening services¹². Given that nearly half of the respondents reported previous sexual activity, there is an urgent need for interventions aimed at improving awareness of HPV infection, cervical cancer prevention, screening, and vaccination. Since HPV infection is frequently acquired shortly after sexual debut, promoting vaccination before exposure and encouraging preventive health behaviours should remain important public health priorities¹².

Conclusion

This research has shown a lack of knowledge and awareness about HPV infection and cervical cancer among female undergraduate students of the University of Jos. The knowledge of HPV was low and the knowledge about cervical cancer, its risk factors, symptoms, prevention of cervical cancer and screening was poor. There was moderate knowledge about a few risk factors and preventive measures for HPV, but there were significant misconceptions and gaps in knowledge.

Study Limitations

This study has some limitations. First, its cross-sectional design precludes causal inferences between participants' characteristics and their knowledge of HPV and cervical cancer. Second, the use of self-administered questionnaires may have introduced recall and social desirability bias. Finally, the study was conducted among female undergraduate students from a single university, which may limit the generalizability of the findings to other populations or settings. Despite these limitations, the study provides important baseline evidence on HPV and cervical cancer knowledge among young women in Nigeria and highlights areas requiring targeted health education interventions.

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Data Availability: All the data are available

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