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Socio-Demographic Factors Associated with the Risk of HPV Infection Among Sexually Active Women in Adamawa and Taraba States

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Abstract

Human papillomavirus (HPV) infection is the most prevalent sexually transmitted viral infection worldwide, especially among young, sexually active individuals. Persistent infection with high-risk HPV types significantly increases the risk of developing cervical cancer. This study investigates the socio-demographic factors associated with the risk of HPV infection among sexually active women in Adamawa and Taraba States, Nigeria. The study was conducted from June 2022 to June 2023. A structured questionnaire was administered to collect socio-demographic data. Pelvic examinations and sample collections were performed to detect HPV and cytological abnormalities. Descriptive and Chi-square analyses were conducted to explore the relationships between HPV infection and various risk factors. The result revealed that, among the participants, the analysis revealed no significant association between HPV infection and knowledge about cervical cancer or HPV, including its transmission and prevention methods. However, significant associations with HPV infection were identified for the age at first sexual intercourse, history of sexually transmitted infections (STIs), and alcohol

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consumption (P=0.00, 0.04, and 0.014, respectively). Age group analysis showed the highest infection rates in women aged 16-20 years. A younger age at first sexual intercourse was strongly associated with increased infection risk. Although multiple sexual partners, history of abortion, and smoking showed higher infection rates, these factors were not statistically significant. Reproductive history analysis indicated that high parity and younger age at first menstruation were significantly associated with increased risk of HPV infection. This study conclusively highlights, the importance of socio-demographic and behavioral factors in the risk of HPV infection among women in Adamawa and Taraba States. Younger age at first sexual intercourse, a history of STIs, and alcohol consumption are significant risk factors, emphasizing the need for targeted public health interventions to reduce the incidence of HPV-related diseases in these regions.

Keywords: HPV infection, Cervical cancer, Socio-demographic factors, Sexually active women, Sexual behavior, Reproductive Health, Public health

INTRODUCTION

Human papillomavirus (HPV) infection is the most prevalent sexually transmitted viral infection globally, particularly among young, sexually active individuals (Bernard *et al.,* 2010). It poses a significant health burden due to its strong association with various cancers, notably cervical cancer, which contains high-risk HPV DNA in 99.7% of cases (WHO, 2013). While most HPV infections are cleared or become inactive within 12 to 24 months, persistent infections with high-risk types significantly increase the risk of cervical cancer and other anogenital cancers (Asiaf *et al.,* 2014; Peng *et al.,* 2017). This progression from HPV infection to cancer involves precursor lesions developing into malignant epithelial lesions over time. The incidence of cervical cancer is rising, especially among younger women, and it remains a leading health issue for women of childbearing age, involving conditions such as inflammation, injury, deformity, and tumors (Zheng *et al.*, 2019).

Several socio-demographic and behavioral factors influence the risk of HPV infection and the subsequent development of cervical cancer. Persistent high-risk HPV infection, particularly with types 16 and 18, is the most critical factor. Additional risk factors include socioeconomic status, lack of knowledge about HPV, early age at first sexual intercourse, multiple sexual partners, high parity, use of oral contraceptives, and smoking. Globally,

about 99% of cervical cancer cases are linked to HPV, with serotypes 16, 18, 45, 31, and 33 being the most oncogenic (Tabone *et al.,* 2012). Approximately 80% of women will contract an HPV infection in their lifetime, and about 6% of cervical cancer cases involve multiple HPV infections. This study examines the socio-demographic factors associated with the risk of HPV infection among sexually active women in Adamawa and Taraba States, Nigeria.

MATERIALS AND METHODS

Study Areas

Adamawa State: The study was conducted in two Local Government Areas of Adamawa State, Nigeria: Mubi and Numan. Numan Local Government Area is situated within Adamawa State, in the North-east geopolitical zone of Nigeria. The study area lies between latitude 9°10' and 9°39' N of the equator and between longitudes 10°24' and 12°55' E of the Greenwich Meridian. While Mubi is the capital of Mubi North Local Government Area of Adamawa State in Nigeria It is divided into Mubi North and Mubi South. It lies on latitude 10°32'N to 10°11'N and longitude 13°12'E to 13°35'E, with a total landmass of 506.4 square kilometers and a population size of 759,045 people.

Taraba State: The study was conducted in two hospitals in two LGA of the State: Jalingo and Mutun Biyu. All laboratory analyses were carried out at the Taraba State Specialist Hospitals Jalingo. Taraba State and located in North Eastern Nigeria. It derived its name from the Taraba River that traversed its southern region. The study area encompasses a total land area of 54,428sqkm and had a population of 2,688,944. It shares its borders with Nasarawa and Benue States to the west, Plateau State to the northwest, Bauchi State and Gombe States to the north, Adamawa State to the northeast, and North-West Province, claimed by both Ambazonia and Cameroon, to the south. Mutum-biyu is the headquarters of Gassol LGA located about 80 km west of Jalingo, the state capital. It has a Latitude of 8° 38' 28" N, Longitude: 10° 46' 24" E (Lat/Long (dec): 8.64138,10.77355) with a Population of 11,702 (2016) (Magaji, 2018).

Ethical considerations: Ethical clearance for the study was obtained from the ethics committee of the Federal Medical committee before the commencement of the study.

Questionnaire administration

A structured study questionnaire was obtained from each participant. The questionnaire was translated into Hausa or Fulani language to make it more comprehensible to the local women by an interpreter. Socio-demographic data including; age, occupation, level of education, marital status, age at start of active sexual activity, age at first menstruation and sexual intercourse, inter menstrual bleeding, number of sexual partners, parity, miscarriages, use of condom, history of smoking were determined. The phone numbers of the participants were collected for disclosure of the results, counseling and advice on further management where necessary.

Sample collection

The collection of the sample was done by a trained nurse. Pelvic examination was performed on case subjects to obtain exfoliated cells for visual inspection with 5% diluted acetic acid for the presence of precancerous lesions, preparation of a Pap smear for cytological abnormalities and determination of the presence of HPV. In collecting the sample, the women were placed in lithotomy position, the cervix was exposed using the bivalve speculum and then inspected for changes such as acetowhite lesions or saffron-yellow areas after the application of 5% acetic acid and/or Lugol's iodine. The specimen was collected using the cyto-brush; the procedure was performed in duplicate; The exfoliated cells swabs collected were smeared on the slide and fixed in 95% ethanol and then transported to the laboratory for staining. The cytobrush was rinsed in phosphate-buffered saline (PBS), and the cell suspension was centrifuged for 10 minutes at 2000 rpm and room temperature. The cell pellets were stored at 70 °C in the field until they were transported to Federal Medical Centre (FMC) Molecular Lab for the delectation of HPV

Statistical analysis

Statistical analysis was done using computer software Statistical Package for Social Science version 20.0(SPSS Inc; Chicago USA). Frequency tables were generated and the results tested for significance using student t-test and chi-square. The age-specific prevalence and the contribution of other socio-demographic factors were computed. The risk of acquiring

hrHPV was estimated with odds ratio. Statistical test of association was carried out at the level of significance set at P value <0.05 at 95% confidence interval.

RESULTS

As shown in table 1, a logistic regression analysis was conducted to explore the relationship between HPV infection and participants' knowledge about cervical cancer (CC) and human papillomavirus (HPV), including its route of transmission and preventive measures using Pap smear as gold standard test. The analysis of risk factors associated with HPV infection based on knowledge. The findings shows that individuals without knowledge of cervical cancer had an infection rate of 102 (43.0%), while those with knowledge had a rate of 94 (48.2%), with an odds ratio (OR) of 0.940 (95% CL: 0.614-1.439, p = 0.775), indicating no significant association. Similarly, those without knowledge of HPV had an infection rate of 166 (44.9%), compared to 30 (48.4%) among those with knowledge, with an OR of 1.030 (95% CL: 0.533-1.99, p = 0.930), also showing no significant association. Regarding knowledge on how it could be prevented, 154 (44.3%) of those unaware of prevention methods were infected, against 42 (50.0%) of those aware, with an OR of 0.830 (95% CL: 0.484-1.42, p = 0.498), again indicating no significant difference. Lastly, 154 (44.3%) of women who did not know the route of transmission were infected, compared to 42 (50.0%) of those who knew it its route of transmission, with an OR of 1.257 (95% CL: 0.702-2.25, p = 0.442), showing no significant association. This suggests that knowledge about cervical cancer, HPV, its prevention, and transmission does not significantly impact the risk of HPV infection among the individuals examined**.**

Table 1: Socio-demographic factors associated with risk of HVP infection based on Knowledge of CC and HPV

Factor		No examined	infection (%)	OR	95% CL	P-Value	Chi-Square
Knowledge of cervical cancer	No	237	102(43.0%)	0.940	0614-1.439	0.775	**0.081**
	Yes	195	94(48.2%)	-	-	-	
Knowledge of HPV	No	370	166 (44.9%)	1.030	0.533-1.99	0.930	**0.008**
	Yes	62	30 (48.4%)	-	-	-	
Do you know how it can be prevented	No	346	154(44.3%)	0.830	0.484-1.42	0.498	**0.462**
	Yes	86	42(50.0%)	-	-	--	**-**
Do you know its route of transmission	No	348	154(44.3%)	1.257	0.702-2.25	0.442	**0.592**
	Yes	84	42(50.0%)				

Table 2 depicts the distribution of risk factors related to the risk of HPV infection in cervical smears from women, based on their attitudes. Significant associations with HPV infection were found for age at first sexual intercourse, history of STIs among participants and alcohol consumption, (P=0.00, 0.04, and 0.014) respectively while other factors such as age, multiple sexual partners, condom use, and smoking did not show significant associations with infection risk. The age group 16-20 years has the highest rate of HPV infection at 87 (48.9%) whereas the age group 26-30 years had the lowest rate of HPV infection, although this finding was not statistically significant (OR = 0.724, 95% CL: 0.193-2.725, p = 0.633). When examining the age at first sexual intercourse, the highest infection rates were seen in women who had their first sexual intercourse between the ages of 26-30, with infection rates of 30 (47.6%), while the age group 11-15 and 16- 20 had the same rate of HPV infection at 28(45.2%) and 87(45.2%) respectively. The least infected age group was age group 21-25 with an infection rate of 51(39.8%). Both age groups showed highly significant odds ratios of 9.484 (95% CL: 7.435-2.514, p = 0.000) and 9.974 (95% CL: 5.336-1.686, p = 0.000), indicating a strong association between younger age at first intercourse and increased infection risk. For multiple sexual partners, the infection rate was higher 65(47.1%) for those with multiple partners and lower 131 (44.6% for women with a single partner, but this difference was not statistically significant (p = 0.585), suggesting that the number of sexual partners did not significantly affect HPV infection risk. The history of abortion showed a higher infection rate of 64 (47.1%) for women who had an abortion and a lower infection rate at 132(44.6%) for those who had not, with no significant association (p = 0.745). Women with a history of sexually transmitted infections (STIs) had higher 73 (46.2%) positive case compared to 123 (44.9%) for those with no history of abortion, but this difference was not significant (p = 0.042). Women who never used condoms demonstrated a higher prevalence 143(45.5%) compared to those who persistently used condoms 53(44.9%) with no significant difference (p = 0.584). Similarly, women who smoked cigarettes displayed a higher rate of infection 162 (45.8%) compared to non-smokers (34, 43.6%). However, no significant association was found between smoking and HPV infection. However, alcohol consumption was significantly associated with a higher infection rate, with 138 (55.2%) of alcohol consumers infected compared to 58 (42.2%) of non-consumers. The odds ratio for alcohol consumers was 1.790 (95% CL: 1.123-2.852, p = 0.014), indicating a higher risk of infection among those who consume alcohol.

Table 2: Distribution of socio-demographic factors associated with HVP infection in smear from women based on attitude.

Factor		No. Examine	Infection (%)	OR	95% CL	P-Value	Chi-Square
Age (Years)	6-10	62	28(45.2%)	0.880	0.221-3.514	0.959	0.599
	11-25	128	51(39.8%)	1.057	0.277-4.040	0.857	
	16-20	178	87(48.9%)	0.724	0.193-2.725	0.633	
	21-25	54	26(48.1%)	0.769	0.191-3.105	0..713	
	26-30	10	4(40.0%)	-.0.127	0.03	0.935	
Age at 1st sexual intercourse	11-15	62	28(45.2%)	1.101			3.810
	16-20	178	87(45.2%)	9.484	7.435-2.514	0.000	
	21-25	128	51(39.8%)	1.369	5.445-2.225	0.000	
	26-30	64	30(47.6%)	9.974	5.336-1.686	0.000	
Multiple sexual partners	Single	294	131(44.6%)	1.124	0.739-1.709	0.585	0.585
	Multiple	138	65(47.1%)	0.117	0.298-0.585	0.532	
Have you ever had an abortion	YES	136	64(47.1%)	0.933	0.613-1.419	0.745	0.745
	NO	296	132(44.6%)	-	-	-	
sexually transmitted infection	No	274	123(44.9%)	0.919	0.611-1.382	0.042	0.165
	Yes	158	73(46.2%)	-	-	-	
Persistence use of condom during sex	Yes	118	53(44.9%)	1.135	0.721-1.789	0.584	0.301
	No	314	143(45.5%)	-	-	-	
Do you smoke	No	78	34(43.6%)	0.798	0.476-1.339	0.393	0.736
	Yes	354	162(45.8%)	-	-	-	
Alcohol	Yes	105	58(55.2%)	1.790	1.123-2.852	0.014	6.059
	No	327	138(42.2%)	-	-	-	

Distribution of Risk factors associated with HVP infection in cervical smear based on reproductive factors

Table 3 shows the risk factors for HPV infection in relation to reproductive history of the subjects determined by multivariate logistic regression analysis of the tested covariates. Subjects within the age group 17-20years had the highest prevalence of cytological abnormalities of 17(60.7%) than those within the age group of 13-16 years that had 150(45.5%). this was followed by the age group of 9-12 years with 29 (39.7%) while subjects within the age group of 21-24 had no infection. ***Parity***: Respondent with 11-15 parities had ahigh prevalence of cytological abnormalities accounting for 43(21.9%). and OR = 2.285, df=4, 95%CL= 0.125-0.647, P=0.003. ***Age at first menstruation*** was statistically significant (P=0.000). Respondents with 1-5 times number of parity had increase risk HPV of infections with OR=0.547, df=4, 95%CL =0.263-1.137, P= 0.032. The likelihood of miscarriage in this group had OR= 0.727, df=4, 95%CL=0.77-1.636, P=0.636, while the 6-10 times pregnancy had OR= 0.961, df=1, 95%CL=0.0647-1.427, P=0.204. They had high rate of infection 41 (40.2%), while participants with difficulty during menstruation had low risk of HPV infection OR= 1.524, df=4, 95%CL=0.656-3.545 P=0.844. Hence, there were no significant difference observed among women with either miscarriage, pregnancy and difficulties during menstruation and HPV infection.

Table 3: Socio-demographic factors associated with risk of HVP infection based on reproductive factors.

Indicators	Response	NO Examined	Infection (%)	OR	95% CL	P-value	Chi-Square
Age at menstrual circle	9-12	72	29(39.7%)	6.85	2.76-1.699	0.000	4.407
	13-16	330	150(45.5%)	5.362	2.767-1.206	0.000	
	17-20	28	17(60.7%)	2.936	2.936-2.936	0.000	
	21-24	1	0(0.0%)	-	-	-	
Have menstrual difficulties	Yes	199	91(45.5%)	0.961	0.647-1.427	0.320	0.039
	No	232	105(45.3%)	-	-	-	
No of pregnancy	1-5	270	131(48.5%)	1.100	0.513-2.358	0.806	0.001
	6-10	102	41(40.2%)	1.524	0.656-3.545	0.328	
	11-15	19	6(31.6%)	2.072	0.610-7.036	0.243	
	>15	3	2(66.7%)	0.481	0.038-6.016	0.570	
	Not at all	37	16(43.2%)	-	-	-	

No parity	1-5	166	73(46.8%)	0.547	0.263-1.137	0.106	
	6-10	137	58(42.3%)	0.623	0.298-1.301	0.208	
	11-15	70	43(60.6%)	0.285	0.125-0.647	0.003	
	>15	21	7(33.3%)	1.002	0.321-3.129	0.998	
	Not at all	47	15(31.9%)	-	-	-	
Have you ever had miscarriage	No	261	118(45.0%)	1.107	0.727-1684	0.636	0.224
	Yes	170	78(45.9%)				

DISCUSSION

In this study, it was observed that HPV infection was more prevalent among participants who had their first sexual intercourse between the ages of 16 and 20 years. This finding aligns with the study by Ezebialu *et al.* (2020), that late onset of sexual activity does not necessarily protect against HPV infection later in life. Heywood *et al.* (2022) also suggest that early age at first sexual intercourse can be an indicator of early exposure to HPV and other sexually transmitted infections (STIs). It is well-established that most young women have their first sexual experiences during adolescence, and several studies have pointed to the increased risk of HPV infection associated with early sexual debut (Adegbesan-Omilabu *et al.,* 2014).

Our study revealed that the prevalence of HPV infection among women with a history of sexually transmitted infections was high (44.9%) and statistically significant (P=0.042). This finding contrasts with a study conducted by Loya *et al.* (2016), which reported no significant difference in relation to sociodemographic characteristics. This finding was inconsistent with the findings of Wang *et al.*, (2019) who reported a 63.9% positivity rate of STIs and almost same with with the report of Martnelli *et al.* (2019) with a % positivity rate of STIs of 49.2%. Previous research has suggested that cervical infection with other STIs, such as *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, Herpes simplex virus (HSV), and *Trichomonas vaginalis,* may increase susceptibility to genital HPV infection.

In this study, alcohol consumption and HPV infection were significantly associated this also align with the findings of Oh *et al.* (2015) who also found a significant association between alcohol consumption and HPV infection. Our findings reported 55.2% rate of HPV infection among women who consumed alcohol, this was inconsistent with the report of Ashaka *et al.*, 2022 in Nigeria and Oh *et al.*, 2015 who reported 19.4% and 45.4% respectively. Excessive consumption of alcohol weakens the immune system, potentially

increase the risk and severity of HPV infection. A compromised immune system may have difficulty effectively clearing the virus, which could lead to persistent infection and elevated risk of developing HPV-related complications such as cervical cancer.

Majority of participants 87 (48.9%) in this study, fell within the age group of 16-20 years. This suggests that a significant portion of this population may be harboring a persistent HPV infection, a known risk factor for cervical cancer, (IARC, 2015. This prevalence rate surpassed that reported in China among individuals aged 35-40 years, which found a prevalence of only 13.8% (Yang *et al.,* 2022). This higher prevalence among younger age groups, may be attributed to several factors; women aged 19 and younger who are sexually active are more susceptible to HPV infection due to their immature cervical development and incompletely developed autoimmune functions (Morris *et al.,* 2019). This

However, women having multiple sexual partners was not significantly associated with HPV infection (p=0.532). Interestingly, our study reported a high prevalence of HPV infection (47.1%) among women with multiple sexual partners. This prevalence was higher than the 33.3% reported by Nejo *et al.* (2018), which contrasts with the current evidence on the association between sexual behavior and HPV infection as presented by Winer *et al.* (2016). Winer's study indicated that women who reported having one or more sexual partners were almost three times more likely to have an incident detectable high-risk HPV infection compared to those who reported having only one sexual partner.

Cigarette smoking has long been associated with an increased risk of cervical HPV infection. In our study, we found that 46.6% of individuals had a history of cigarette smoking (direct smokers) and no significantly associated was found between smoking and persistent HPV infection. This prevalence was higher than the 33.3% reported by Nejo *et al.* (2018) in Nigeria.

CONCLUSION

Human papillomavirus (HPV) is the most common sexually transmitted infection globally, posing a significant health risk due to its strong association with various cancers, notably cervical cancer, found in 99.7% of cases. Most HPV infections are cleared within 12 to 24 months, but persistent infections with high-risk types can lead to cervical and other anogenital cancers. The incidence of cervical cancer is rising, especially among younger women, and several socio-demographic and behavioral factors influence HPV infection

risk. These factors include socioeconomic status, lack of knowledge about HPV, early sexual activity, multiple sexual partners, high parity, use of oral contraceptives, and smoking. The study was conducted from June 2022 to June 2023, involving sample collection by trained nurses. Pelvic examinations were performed to obtain exfoliated cells for visual inspection, Pap smears, and HPV detection. The collected specimens were processed and analyzed at the Federal Medical Centre (FMC) Molecular Lab. There was no significant association was found between knowledge of cervical cancer and HPV infection rates and similar findings were observed for HPV knowledge, with no significant difference in infection rates between knowledgeable and non-knowledgeable individuals. Awareness of prevention methods and transmission routes did not significantly impact HPV infection risk. Younger age at first intercourse was significantly associated with higher HPV infection rates while a significant association was found between a history of STIs and alcohol consumption and higher HPV infection rates. Other Factors such as Age, multiple sexual partners, condom use, and smoking did not show significant associations with HPV infection risk. Age at first menstruation and higher parity were significantly associated with increased HPV infection risk. No significant differences were observed among women with miscarriages, pregnancies, or menstrual difficulties regarding HPV infection risk.

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