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# Prevalence and Risk Factors Associated with Human Papilloma Virus Infection among Women Attending Selected Hospitals in Sokoto, Sokoto State, Nigeria

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***Abstract***

*Human Papilloma Virus (HPV) infection is the primary cause of virtually all cervical cancers. Cervical cancer despite being largely preventable is still the leading cause of gynaecological cancer related death among females in developing countries. This study was carried out to determine the prevalence and risk factors associated with Human Papilloma Virus infection among women attending selected hospitals in Sokoto, Sokoto State, Nigeria. This study involves the use of questionnaire to obtain data on socio-demographic and risk factors as well as the analysis of high vaginal swab obtained from 208 women. The high vaginal swab samples were analysed for Human Papilloma Virus antigen using ELISA. Prevalence of 6.23% of Human papilloma virus infection was recorded in this study. Marital status, cigarette smoking, number of Co-wives, use of condom and age at first sex were identified as significant risk factors for Human papilloma virus infection in this study. This study identified a low burden of Human papilloma virus infection in Sokoto, Nigeria.*

***Keywords:*** *Prevalence, risk factors, Human papilloma virus and women*

## Introduction

Human papillomavirus (HPV) is among the most frequently sexually transmitted pathogen in humans. Decades of studies have revealed that, the papilloma viruses are highly diverse and occur mostly in humans, mammals and birds (Okoror and Osanyinlusi, 2018). There are more than 200 different Human papillomavirus (HPV) genotypes recognized to date which are classified into high and low risk genotypes based on their malignancy causing potential (Farahmand *et al.,* 2020). The low risk Human papillomaviruses (HPVs) are responsible for causing benign epithelial hyperplasias (wart) while the high risks are associated with cancers (Omotayo *et al.,* 2020). Persistent human papillomavirus infection which is prolonged infection of the virus in which it integrates into the human DNA are linked to almost all cases of cervical cancer (95%) (WHO, 2022).

Cervical cancer is the fourth most frequent type of gynaecological cancer worldwide (Farahmand *et al.,* 2020), with a high mortality rate. More than 270,000 women annually die from cervical cancer worldwide and most of them (85%) are in the developing countries

(Farahmand *et al.,* 2020). In Nigeria, cervical cancer is the second most common cancer in women aged 15 to 44 years with an annual incidence of 14,943 and a mortality of 10,403 (Bruni *et al.,* 2019). It is not clearly understood why HPV infection in certain individuals and result in more severe lesion in others. It however, revealed that an individual's susceptibility and other enabling factors such as; immune status, nutrition, endogenous and exogenous hormones, tobacco smoking, high parity, prolonged use of oral contraceptives, genetic disorders, early sexual debut, non-circumcision of the male partner and co-infection with other sexually-transmitted pathogen (Sheba *et al.,* 2019).

Most of the burden of Human Papillomavirus associated with malignant and benign disease occurs in developing countries without effective screening programmes and poor access to medical services. In northern Nigeria, cervical cancer is common and accounts for 70.5% of all genital tract malignancies (Mohammed *et al.,* 2015). Early marriage, polygamous marriages, high parity, tobacco smoking, long term hormonal contraceptive use, co-infection with *Chlamydia trachomatis*, Herpes simplex virus type 2, immunosuppression, certain dietary deficiencies, genetic and immunological host factors are contributing factors to cervical cancers (Awodele, 2011). Other factors such as imbalanced vaginal flora and having an uncircumcised male partner are just emerging as risk factors (Veldhuijzen *et al.,* 2010). Despite the presence of most risk factors, there is paucity of data on Human papillomavirus in the study area (Mohammed *et al.,* 2015).

Human papillomavirus screening is one of the most essential tools for the early diagnosis of cervical cancer and has been found to be the most effective preventive measure. The value of Human papillomavirus screening in reducing the risk of cervical cancer and mortality has been established, and the risk of developing cervical cancer can be reduced by 80% (Oche *et al.,* 2013). The aim of this study is to determine the prevalence and risk factors associated with Human Papilloma virus infection among women visiting selected hospitals in Sokoto, Sokoto State, Nigeria.

## Materials and Methods

### Study Design and Population

This study was Hospital based cross-sectional study. Study subjects were attendees of Usmanu Danfodiyo University Teaching Hospital (UDUTH) and Specialist Hospital Sokoto. Patients of different ages who attended the hospitals during the period of the study were included after written consent is given. However, patients menstruating or bleeding per vaginum at the time of specimen collection and those who are not willing to participate in the study were excluded.

### Sample Size Determination

The sample size was calculated using formula of calculating prevalence.

$$N = \frac{PQ}{(E \div 1.96)2}$$

Where n = sample size; p = Maximum known prevalence of the condition, q = 1-p (proportion of persons free of the condition), E = Allowable error margin (0.05), 1.96 = Standard normal deviation (a constant). Using the maximum reported prevalence of 15.5% (Bruni *et al.,* 2019).

$$N = \frac{0.155 * 0.845}{(0.05/1.96)2}$$ Therefore; N = 202.

**Ethical Approval**

Ethical approval for the study was obtained from the ethical committee of Usmanu Danfodiyo University Teaching Hospital and Specialist Hospital Sokoto.

**Collection of Demographic and risk factors Data**

Socio-demographic and risk factors data of the participants including age, marital status, age at start of active sexual activity, age at first pregnancy, number of sexual partners, parity, use of hormonal contraception, use of condom, education and history of smoking were obtained by administration of questionnaire to each participant.

**Cervical Sample Collection**

A sterile swab stick was used to collect the exfoliated cells from the squamo-columnar junction of the ecto and endo cervix. It was inserted into the cervical canal and rotated five times in a clockwise direction whilst applying light pressure to collect all the necessary cells which adhered to the flat sides of the bristles. This procedure was carried out by Doctors in the department of Obstetrics and Gynaecology of the two study site (Usmanu Danfodiyo University Teaching Hospital and Specialist Hospital Sokoto) (Sheba *et al.*, 2019).

**Detection of Human Papilloma Virus using ELISA**

The high vaginal swab samples were analysed using Human Papillomavirus Antigen Elisa Kit (Abbexa, Cambridge, UK) to check for the presence of human papilloma virus antigen. The cervical cell suspensions were transferred into sterile Eppendorf tubes and centrifuged at 1000rpm for 20 minutes, the sediment were discarded and the supernatants were used for the assay. All reagents were brought to room temperature before use. Two positive control, two negative controls and control (zero) well were set on pre-coated plate respectively and their positions were recorded. Fifty microliter (50µl) of positive, negative and sample diluent buffer (control) were placed into their set wells. Fifty microliter (50µl) of appropriately diluted samples was placed into the samples well. The Elisa plate was gently tapped to mix the samples. The plate was covered with the plate sealer and incubates for 30mins at 37˚C. After the incubation period, the cover was removed and the liquid was discarded and the plate was washed five times (5x) using wash buffer. Fifty microliter (50µl) of detection reagent was added to each well except control (zero) well. The plate was covered with plate sealer and incubated for 30mins at 37˚C. After the incubation period, the cover was removed and the liquid was discarded and the plate was washed five times (5x) using wash buffer. Fifty microliter (50µl) of TMB substrate A and B were added to each well and the plate was covered with plate sealer and gently tapped to mix thoroughly before incubation at 37˚C for 15mins. Fifty microliter (50µl) of stop solution was added to each well. The optical density was measured at 450nm. Mean optical density of positive control should be $\geq 1$ while mean optical density of negative control should be $\leq 0.2$. The average of negative control well plus 0.15 was taken as the cut off value. Any sample whose optical density is higher than the calculated cut off value was reported as positive for Human Papillomavirus.

**Statistical analyses**

Crude association between HPV positivity and each of the Socio-demographic data characteristics was assessed using the chi-squared test. Significance level was considered at $\alpha = 0.05$ and unadjusted odds ratios (OR) were reported with their corresponding 95% confidence intervals (CI).

## Results

### Prevalence of Human Papilloma virus in the study area

A total of two hundred and eight (208) cervical swab and blood samples of women attending selected hospitals in Sokoto metropolis were screened for Human Papilloma virus infection using Abbexa (HPV L1) Elisa kit (Cambridge UK). Thirteen (13) of the screened cervical swab samples were positive for Human Papilloma virus while one hundred and ninety five (195) were negative resulting to a calculated prevalence of 6.3% (Table 1).

**Table 1: Prevalence of Human Papilloma virus in the study area**

| Parameters | Frequency (n) | Prevalence (%) |
|---|---|---|
| Number Positive | 13 | 6.3 |
| Number negative | 195 | 93.7 |
| **Total Number tested** | **208** | **100** |

### Demographic Distribution of the Participants

Distribution and occurrence of Human Papilloma virus infection based on demographic factors of the participants is given on Table 2. Age group 37-46 years has the highest infection of Human Papilloma virus 12.5% (2/16) followed by age group 27-36 years with 10% (8/80) and age group 17-26 years with 2.7% (3/110). Civil servants have the highest infection of Human Papilloma virus 14.3% (1/7) followed by Housewives 6.8% (7/103) and Businesswomen 5.3% (5/94). Literate study subjects have the highest infection of Human Papilloma virus 6.5% (10/154) while illiterate study subjects have 5.6% (3/54). Statistical analysis using Pearson Chi-square analysis indicated that, there was no association between this infection and age, occupation and level of education of the participants ($p$-value>0.05). Widows have the highest infection of Human Papilloma virus 50% (1/2) while married women have 5.8% (12/206). Statistical analysis using Pearson Chi-square analysis indicated that, there was association between this infection and marital status of the participants ($p$-value<0.05).

**Table 4.2: Distribution and occurrence of Human Papilloma virus infection based on demographic factors of the participants**

| Variable | HPV Status | | Total (n) | *P*-value |
|---|---|---|---|---|
| | Negative (%) | Positive (%) | | |
| **Age Range** | | | | |
| 17-26 | 107 (97.3%) | 3 (2.7%) | 110(100%) | |
| 27-36 | 72 (90%) | 8(10%) | 80(100%) | |
| 37-46 | 14 (87.5%) | 2(12.5%) | 16(100%) | |
| >46 | 2 (100.0%) | 0(0.0%) | 2(100.0%) | 0.142 |
| **Occupation** | | | | |
| Housewife | 96 (93.2%) | 7(6.8%) | 103(100%) | |
| Business woman | 89(94.7%) | 5(5.3%) | 94(100%) | |
| Civil servant | 6(85.7%) | 1(14.3%) | 7(100%) | |
| Student | 2(100%) | 0(0.0%) | 2(100%) | |

| | | | | |
|---|---|---|---|---|
| Tailoring | 2(100%) | 0(0.0%) | 2(100%) | 0.873 |
| **Marital Status** | | | | |
| Married | 194 (94.2%) | 12(5.8%) | 206(100%) | |
| Widow | 1(50%) | 1(50%) | 2(100%) | 0.010 |
| **Education** | | | | |
| Literate | 144 (93.5%) | 10(6.5%) | 154(100%) | |
| Illiterate | 51(94.4% | 3(5.6%) | 54(100%) | 0.806 |

**Risk factors Associated with Human Papilloma Virus**

Distribution and occurrence of Human Papilloma virus infection based on risk factors of the participants is given on Table 3. Human Papilloma virus infection was detected only among those who have only one partner/previous husband 6.8% (13/190). Those who use contraception have the highest infection of Human Papilloma virus 8% (9/112) while those who are not using contraception have 4.2% (4/96). Multiparous participants have the highest rate of Human Papilloma virus infection 6.4% (11/168) followed by primiparous 5.4% (2/37). Statistical analysis using Pearson Chi-square analysis indicated that, there was no association between this infection and number of sexual partners/previous husband, use of contraception and parity of the participants ($p$-value>0.05). Those who smoke cigarette have the highest infection of Human Papilloma virus 66.7% (2/3) while those who does not smoke cigarette have 5.4% (11/205). Those who had one co-wife have the highest infection of Human Papilloma virus 16.7% (6/36) followed by those with no co-wife 4.5% (7/155). Participants who had their first sex less than 18 years have the highest Human Papilloma virus infection 13.1% (11/84) than those who had their first sex 18 years above 1.6% (2/124). Statistical analysis using Pearson Chi-square analysis indicated that, there was no association between this infection and cigarette smoking, number of co-wives and age at first sex of the participants ($p$-value<0.05).

**Table 3: Distribution and occurrence of Human Papilloma virus infection based on risk factors of the participants**

| Variable | HPV Status | | Total (n) | *P*-value |
|---|---|---|---|---|
| | Negative (%) | Positive (%) | | |
| **Number of sexual partners/previous husband** | | | | |
| One partner | 177 (93.2%) | 13(6.8%) | 190(100%) | |
| Two partner | 16(100%) | 0(0.0%) | 16(100%) | |
| Three partner | 1(100%) | 0(0.0%) | 1(100%) | |
| Four partner | 1(100%) | 0(0.0%) | 1(100%) | 0.726 |
| **Cigarette smoking** | | | | |
| Yes | 1 (33.3%) | 2(66.7%) | 3 (100%) | |
| No | 194(94.6%) | 11(5.4%) | 205(100%) | 0.000 |
| **Number of Co-wife** | | | | |

| | | | | |
|---|---|---|---|---|
| No co-wife | 148 (95.5%) | 7(4.5%) | 155(100%) | |
| One co- wife | 30(83.3%) | 5(16.7%) | 35(100%) | |
| Two co- wives | 16(100%) | 0(0.0%) | 16(100%) | |
| Three co- wives | 1(100%) | 0(0.0%) | 1(100%) | 0.035 |
| **Use of contraceptive** | | | | |
| Yes | 103 (92.0%) | 9(8.0%) | 112(100%) | |
| No | 92(95.8%) | 4(4.2%) | 96(100%) | 0.250 |
| **Age of first Sex** | | | | |
| <18 | 73 (86.9%) | 11(13.1%) | 84(100%) | |
| >18 | 122(98.4%) | 2(1.6%) | 124(100%) | 0.001 |
| **Parity** | | | | |
| Nullip. | 3(100%) | 0(0%) | 3(100%) | |
| Primip. | 35(94.6%) | 2(5.4%) | 37(100%) | |
| Multip. | 157(93.4%) | 11(6.4%) | 168(100%) | 0.874 |

## Discussion

Human Papilloma Virus infection has reached a considerable proportion worldwide, particularly among women, in whom it is the primary cause of cancer thus making Human Papilloma Virus infection a current public health priority (Kombe-Kombe *et al.*, 2021). In the present study, Human Papilloma Virus infection was detected in thirteen (13) high vaginal swab samples out of two hundred and eight (208) accounting for 6.3% prevalence from women attending gynaecology clinic. This similar to 6.6% reported by Adekunle *et al.* (2013) in Osun and 8.7% reported by Sheba *et al.* (2019) in Kaduna. The prevalence obtained is lower than 10% reported by Modibbo *et al.* (2017) in Abuja and 10.7% reported by Ojiyi *et al.* (2013) in Maiduguri. In addition, it's much lower than the 44.9% reported by Nweke in Lagos, 48% reported by Mohammed *et al.* (2015) in Gombe and 76% reported by Auwal *et al.* (2013) in Kano. The 6.3% prevalence obtained is higher than the 4.9% reported by Okonko and Ofoedu (2015) in PortHacourt. The differences and disparity among the prevalence may be due to differences in the socio-cultural factors of the studied populations, varying exposures to different risk factors and different diagnostic methods employed which include ELISA, cytology and PCR among others and these diagnostic have varying degrees of sensitivities. The finding of this study indicates a low prevalence of Human papilloma virus in the study area.

Participants between the age ranges of 37-46 have the highest infection of Human papilloma virus. The finding of this study agrees with the finding of Okoror and Osanyinlusi (2018) but, in contrast with the findings of Sheba *et al.* (2019) and Aminu (2014). Studies have confirmed that, infection with Human papilloma virus is always associated with high level of sexual activity and naturally sexual activity among human attains it peak within this age group (37-46) and this facilitates easy spread of Human papilloma virus infection among individuals. Latent Human Papilloma Virus infections become detectable among older women even in the absence of re-exposure through sexual activity. The high infection of Human papilloma virus among this age group (37-46) may also be as a result of persistence infection of the virus. There was no significant association between this infection and the age of the participants (P>0.05). The finding of this study suggests that, older women are more likely to be infected with Human papilloma virus infection.

The finding of this study reveals that, civil servants have the highest infections of Human papilloma virus. There was no significant association between this infection and the occupation of the participants (P>0.05).The finding of this study disagrees with the findings of Sheba *et al.* (2019) and Ojiyi *et al.* (2012). Although, civil servants are expected to have improved socio-economic status and high level of awareness about sexually transmitted diseases; Yet, the have access to certain standard of living such as alcoholism, promiscuity which may increase their chances of having these infection. Widows have the highest infection of Human papilloma virus. The finding of this study agrees with the finding of Nejo *et al.* (2018) and disagrees with the finding of Akarolo-Anthony *et al.* (2014) who reported a high infection of Human papilloma virus among the married over the unmarried women. The highest infection among the widows may be due the fact that, single women may be involved in sexual activities with several partners who expose them to acquiring Human papilloma virus infection. There was significant association between Human papilloma virus and the marital status of the participants ($P$<0.05). The finding of this study suggests that unmarried women are more vulnerable to Human papilloma virus infection than those that are married.

Literacy is defined as ability to read and write. Literates study subjects have the highest infection of Human papilloma virus. This agrees with the finding of Omotayo *et al.* (2020) and disagrees with the findings of Sheba *et al.* (2019) and Mohammed *et al.* (2015). The high prevalence among literate may be due to the lack of campaigns and awareness about Human papilloma virus infection in the study area. There was no significant association between these infections and the literacy of the participants ($P$>0.05). The finding of this study indicates that, women that are literate are more vulnerable to Human papilloma virus.

Human papilloma virus infection was only detected among those who have only one partner or previous husband. The finding of this study agrees with the finding of Burchell *et al.* (2010) and is contrary to the findings of Sheba *et al.* (2019) and Mohammed *et al.* (2015). Detection of Human papilloma virus infection among only those who have one partner or previous husband may be due to the fact that, majority of the participant (94%) has only one partner or previous husband. There was no significant association between this infection and the number of sexual partners/previous husband of the participants ($P$>0.05). The finding of this study indicates that, women who have only one partner or previous husband are more vulnerable to Human papilloma virus infection.

The finding of this study reveals that, women who smoke cigarette have highest infection of Human papilloma virus infection. The result of this study agrees with the findings of Mohammed *et al.* (2015) and Okoror and Osanyinlusi (2018). The highest infection of Human papilloma virus among cigarette smokers may be as a result of the mechanism by which smoking increases the risk of infection due to decrease in immune response. In addition, the high Human papilloma virus infection among cigarette smokers may be as a result of tobacco present in cigarette which has been associated with persistent Human papilloma virus infection. There was significant association between these infections and the cigarette smoking of the participants ($P$<0.05).

Human papilloma virus infection is higher among those who share their husband with another wife (Polygamous). The finding of this study agrees with the finding of Sheba *et al.* (2019). Marriage type is highly associated with sexually transmitted disease. In polygamous, the husband marries two or more wives. Therefore, if one of the wives is infected, the husband may contract it and infect the other wife. The finding of this study could be due to the fact that such women can easily acquire sexually transmitted disease from their spouse who has multiple

sexual partners. There was significant association between this infection and number of co-wives of the participants ($P$<0.05). The finding of this study suggests that women that are polygamous are more likely to be infected with Human papilloma virus.

The finding of this study reveals that, those who use contraception have the highest infection of Human papilloma virus. The finding of this study agrees with the finding of Sheba *et al.* (2019) and disagrees with the finding of Ojiyi *et al.* (2012). Contraception are taken by women to prevent been pregnant. However, it also placed them at a risk of persistence Human papilloma virus infection in cervical epithelial cells which could lead to transformation of those cells. There was no significant association between this infection and use of contraception of the participants ($P$>0.05). Multiparous participants have the highest infections of Human papilloma virus. This agrees with the finding of Ojiyi *et al.* (2013), Nejo *et al.* (2018) and Kennedy *et al*. (2016). They found that, patients with higher parity (>3) had about two times higher risk of Human papilloma virus infection. Multiparty probably reflects early sexual exposure which directly influences Human papilloma virus infection. There was no significant association between this infection and parity of the participants ($P$>0.05). The finding of this study suggests that, multiparous participants are more vulnerable to Human papilloma virus infection.

Those who had their first sex less than 18 years of age have the highest infection of Human papilloma virus. This study agrees with the finding of Nejo *et al.* (2019). This could be as a result of earlier intercourse which exposes young adults to other risky sexual behaviour, such as greater numbers of lifetime sexual partners and coexisting partnerships which contribute to acquiring sexually transmitted disease. There was significant association between the infection and age at first sex of the participants ($P$<0.05). The finding of this study indicates that those who started sexual intercourse at early age are more likely to be infected with Human papilloma virus.

## Conclusion

Human papilloma virus prevalence of 6.3% was recorded in this study. Marital status, cigarette smoking, number of Co-wives, use of condom and age at first sex were identified as significant risk factors for Human papilloma virus infection in this study.

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