IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 10, Issue 1 Ser. III (Jan. – Feb. 2021), PP 07-16
www.iosrjournals.org

Epidemiological pattern of Immunological makers and possible risk factors associated with naturally selected high risk group for Oncogenic Human Papilloma Virus Infection in Katsina State, Nigeria

*Abdulkadir B. andHayatudeen M.R,
Department of Microbiology, Faculty of Natural and Applied Sciences, Umar Musa Yar'adua University, Katsina.

***Corresponding author:** Abdulkadir B. (bashir.abdulkadir@umyu.edu.ng)

Abstract
As documented Sub-Saharan region of the world which Nigeriaincluded have the highest burden of Human Papillomavirus (HPV) infection.It is well established that cervical cancer is predominantly caused by a persistent HPV infection of cervical cells. Most studies on HPV surveillance in Nigeria were done in the southern part of the country. Geographical and socio-cultural diversity of Nigeria makes these data unlikely to be universally representative for the entire country. Northern Nigeria generally carries a higher prevalence of cervical cancer and many of its risk factors as well as higher prevalence of HPV infection. This study was carried out to determine the epidemiological pattern and risk factors associated with HPV infection among naturally selected high risk group in Katsina state, Nigeria. The study was an observational hospital based cross sectional study among women of reproductive agepresented with or without clinical symptomsattending some selected hospitals of the state. A total of 182 blood samples were collected from three hospitals located across the three senatorial zones of the state.The serum were separated from the whole blood and used for the analysis. The participant's sociodemographic and other clinical information's were noted with the aid of questionnaires. The IgM antibodies were detected using ELISA kit.The overall seroincidence rate of HPV infection recorded in the study was 36.3% (66/182) and also 33.2%. Pregnant women recorded a high seroincidence rate of 45.2% (43/103) and there was significant association between pregnancy and HPV infection in this study. Katsina senatorial zone recorded the higher seroincidence rate 40.0% of HPV infection. None of the sociodemorgraphic factors analysed in this study shown a significant association with HPV infection. Risk factors found to be associated with HPV infection include HIV status, Sexual partner, Parity, Age at sexual debut, smoking, presence of co-wife and malignancy, large number of children and organ transplantation. Out of the clinical symptom observed only vaginal bleeding and pain during sex had significant association with HPV infection. This study identified a high burden of HPV infection in Northern Nigeria. It further justifies the potential benefit of the currently available HPV vaccines in the area. A larger and community based study is however recommended for better representation of the area.

Keywords*: HPV, IgM, Cervical cancer, Serum, ELISA*

Date of Submission: 11-12-2019 Date of acceptance: 28-01-2021

I. Introduction

Papillomaviruses are ubiquitous and are members of a family *Papillomaviridae* of DNA viruses that infect humans and animals (Manga *et al.*, 2015). Human papillomaviruses (HPVs) are small non-enveloped viruses that contain a double-stranded, closed circular DNA genome. sHPVs are a group of more than 200 related viruses. More than 40 HPV types can be easily spread through direct sexual contact, from the skin and mucous membranes of infected people to the skin and mucous membranes of their partners. They can be spread by vaginal, anal, and oral sex (Isa*et al.,* 2013).

Other HPV types are responsible for non-genital warts, which are not sexually transmitted. More than 120 subtypes of HPVs have been classified based on their oncological potential of transforming cells as Low-risk HPVs, which do not cause cancer but can cause skin warts (Condylomata acuminata) on or around the genitals and anus. For example, HPV types 6 and 11 cause 90% of all genital warts. HPV types 6 and 11 also cause recurrent respiratory papillomatosis, a disease in which benign tumors grow in the air passages leading from the nose and mouth into the lungs. High-risk HPVs, which can cause cancer. HPV types 16 and 18 high risks, are responsible for most HPV cancers (Omoare*et al.,* 2016). In fact, the Centers for Disease Control

(CDC) estimates that more than 90% and 80%, respectively, of sexually active men and women will be infected with at least one type of HPV at some point in their lives (CDC, 2012). Around one-half of these infections are with a high-risk HPV type (Omoare *et al.*, 2016). Virtually all cases of cervical cancer are caused by HPV, and just two HPV types, 16 and 18, are responsible for about 70% of all cases (Botha *et al.*, 2015). About 95% of anal cancers are caused by HPV mostly by HPV type 16 while about 70% of oropharyngeal cancers are caused by HPV.

In developing countries, complications in immunocompromised HIV patients due to HPV and other sexually transmitted diseases are a major cause of mother and child mortality and morbidity during pregnancy (Kennedy*et al.*, 2016). Also HPV is known to increase the incidence of cervical cancer in HIV/AIDS patients (Ferlay *et al.*, 2007). According to the World Health Organization, 85% of cervical cancer cases occur in developing countries, and these cases generate a worldwide burden (WHO, 2014). Their latest report indicated that the incidence of cervical cancer cases in developing countries is more than half a million, with half of these women dying from the disease (Jemal *et al.*, 2011).

In this study we determined the seroincidence of HPV infection and its associated risk factors among naturally selected high risk groupwith or without clinical symptomsattending some selected hospitals of Katsina State, North-western Nigeria.

II. Methodology

Study area and Design

The study was carried out in Katsina State located at the extreme northern margin of Nigeria, the state covers a total area of about 23,938sqkm (3,370sq) with a total population of 5,801,584 people, going by 2006 census (FGN 2007). The state is bounded by Niger Republic to the north, by Jigawa and Kano States to the east, by Kaduna State to the South and by Zamfara State to the West. Katsina State has predominantly Hausa-Fulani indigenes. The state has thirty four (34) local governments' areas (LGAs). The LGAs are divided into three (3) senatorial zones according to their geographical locations, namely; Funtua zone (South), Katsina zone (Central), and Daura zone (North). Three hospital were selected from the zones namely General Hospital Daura, General Hospital Malumfashi and Turai Yar adua Maternity and Children hospital Katsina respectively.The study was an observational hospital based cross-sectional study in which structured questionnaire was administer to the recruited participants and blood samples were collected from those consented and analysed.

Study Population

The study population comprised women of reproductive agethat are coming for Pap smear screening from the three selected hospitals in the State who are naturally high risk group for HPV infectionwith age (15≥years) whose show or no show clinical symptoms of HPV infection.

Inclusion and Exclusion criteria

This includes any women of reproductive age (15≥years) with or without clinical symptoms of HPV infection presenting for Pap smear screening from those selected hospitals that gave their consent while those that are bearing reproductive and those that refused to consent were excluded from the research.

Ethical Approval and Consent

Ethical approval was obtained from the Ethical Committee of General Hospital Services Management Board, Katsina State. Consent form was obtained from participants prior to enrolment in the study.

Research Tool

Prior to sample collection, a structured questionnaire were used to obtain information on Sociodemographic, date, risk factors and clinical information relevant from each participant

Sample Size

The sample size were determined using the formula of Sarmakaddam and Gerald, (2006) at 95% confidence interval and a reported 10.0% HPV prevalence among women attendees for cervical cancer screening at University of Port Hartcourt Teaching Hospital, Nigeria (Kennedy *et al.*, 2016).A total of 182 samples were collected to minimize error and occurrence of result by chance.

Blood collection and Serum extraction

A total of 182 blood samples were collected aseptically using 5ml syringe from participants who gave their consent in the study area. The blood was allowed to clot for 30 minutes and centrifuged at 1000rmp for 10 minutes. The serum was carefully extracted with a transfer pipette and transferred aseptically to a sterile labeled serum storage screw-capped container and stored at -20^{o}C in a freezer until analyzed.

Serological assay for HPV IgM

The serum sample were analyzed using Human Papillomavirus AntibodyIgM(HPV-IgM) specific ELISA kit (96T) manufactured by Melsin Medical Co., Limited, Kuancheng District, Jilin Province, China. The manufacturer's instruction were strictly followed.

Computation and Interpretation of Result

To obtain the cut off O.D value, the O.D of the calibrator was multiplied by the value of the factor printed on the label. The antibody index was calculated by dividing the O.D valueof each sample by the obtained value of cut off. Antibody index lessthan 1.0 is considered negative while greater than or equal to 1.0 is considered positive.

Analysis of Data and Results

Data were subjected to statistical analysis using SPSS version 16.0 (SPSS Inc, Chicago, USA). Chi square analysis were performed at 95% confidence interval to determine the relationship between the variables and HPV infection. P values ≤ 0.05 were considered significant.

III. Results

Of the 182 sera analysed, 36.3% were seropositive for IgM. The IgM seroincidence rates among pregnant women was 45.2% while IgM seroincidence rates among Non-pregnant women was 29.9%. There was statistical significant difference between seroincidence rate of HPV infection among the pregnant and non-pregnant participants (χ^2= 7.601, df= 1, p= 0.030) as shown in Table 1.

Table 1: Serological survey of Oncogenic Human Papillomavirus infection according to the pregnancy status of the participants in Katsina State, Nigeria

Category	Total	Immunoglobulin-M		
		Positive (%)	Negative (%)	P-value
Pregnant Women	105	43 (45.2)	62 (59.1)	0.030*
Non-pregnant	77	23 (29.9)	54 (70.1)	
Total	**182**	**66 (36.3)**	**116 (63.7)**	

**= Statistically significant at 95% confidence interval (i.e.≤0.05)*

Analysis of the results by hospital showed that participants attending Turai Umaru Yar adua Maternal and Children Hospital, Katsina had higher seroincidence rate of 44.1% while the least was found among participants attending General Hospital Daura 33.3%. There was no significant association between seroincidence of HPV infection and the hospitals examined in this study (χ^2= 10.126, df= 3, p= 0.432) (Table 2).

Table 2:Serological survey of Oncogenic Human Papillomavirus infection in relation to the hospital examined in Katsina State, Nigeria

Hospital	Total	Immunoglobulin-M		
		Positives (%)	Negatives (%)	P-value
GH Katsina	26	09 (34.6)	17 (65.4)	0.432
GH Daura	60	20 (33.3)	40 (66.7)	
GH Funtua	62	22 (35.5)	40 (64.5)	
TUYMCH	34	15 (44.1)	19 (55.9)	
Total	**182**	**66 (36.3)**	**116 (63.7)**	

Key: TUYMCH= Turai Umaru Yar adua Maternal and Children Hospital, Katsina
GH= General Hospital

Analysis of the results according to Senatorial District showed higher seroincidence rate in Katsina central 40.0% while the least was recorded in Katsina North 33.3%. There was no statistical significant association between senatorial zones and the HPV infection (χ^2=1.511, df= 2, p=0.322) (Fig.1).

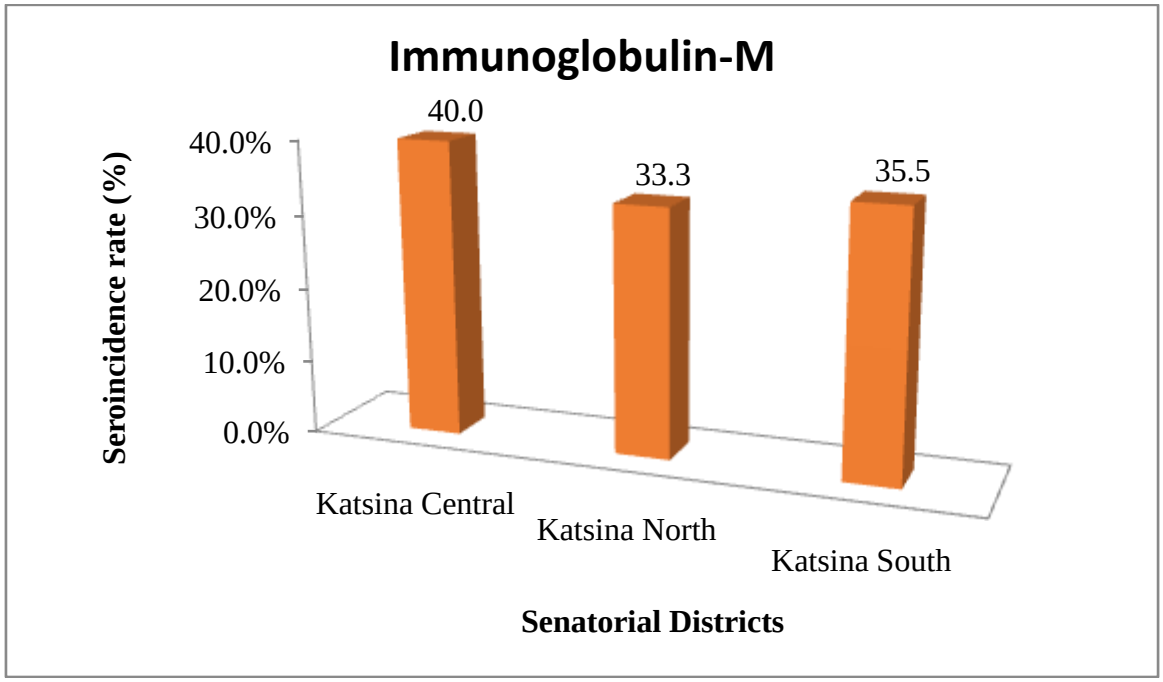

Figure 1: Serological survey of Oncogenic Human Papillomavirus in relation to senatorial district of Katsina State, Nigeria

Analysis of data and result according to age group of the participant is shown in Table 3 were the higher prevalence was recorded (45.8%:38/83) among participants in 21-30yrs group and lower was recorded among age group 31-40yrs (15.4%:6/39). There is no statistical significant association between age group and HPV infection (X^2=8.021, df= 4, P=0.1095).

Table 3: Serological survey of Oncogenic Human Papillomavirus infection in relation to participant's age in Katsina State, Nigeria

Age group	Total	Immunoglobulin-M		
		Positives (%)	Negative (%)	P-value
10-20	12	04 (33.3)	08 (66.7)	0.1095
21-30	83	38 (45.8)	45 (54.2)	
31-40	39	06 (15.4)	33 (84.6)	
41-50	22	08 (36.4)	14 (63.6)	
51 and above	26	10 (38.5)	16 (61.5)	
Total	**182**	**66 (36.3)**	**116 (63.7)**	

The data and results were analysed according to socio-demographic factors as shown in Table 4. The higher seroincidence rates of 42.3% was recorded among participants tertiary level of education while those with primary school level had the lowest 27.9%. There was no statistically significant association between educational level and HPV infection (χ^2= 1.654, df= 3, p= 0.764). Furthermore, higher seroincidence rate of 49.1% was obtained among house wife while lower seroincidence rate was recorded among unskilled 14.3%. There was no statistically significant association between occupation of the participants and HPV infection (χ^2= 2.234, df= 2, p= 0.255). However, married participants had higher IgM seroincidence rate 49.1% while lower was recorded among the widow participants 7.1%. There was statistically significant association between HPV seroincidence and marital status (χ^2= 6.504, df= 3, p= 0.011).

Table 4: Serological survey of Oncogenic Human Papillomavirus infection in relation to socio-demographic factors of the participants in Katsina State, Nigeria

Factors	Total	Immunoglobulin-M		
		Positives (%)	Negative (%)	P-value
Educational status				0.764
None	18	06 (33.3)	12 (66.7)	
Primary	43	12 (27.9)	31 (72.1)	
Secondary	94	38 (40.4)	56 (59.6)	
Tertiary	26	11 (42.3)	15 (57.7)	

Occupational status				0.255
House wife	114	56 (49.1)	58 (50.9)	
Skilled	30	06 (20.0)	24 (80.0)	
Unskilled	28	04 (14.3)	24 (85.7)	
Maritalstatus				0.212
Single	15	00 (0.0)	15 (100)	
Married	114	56 (49.1)	58 (50.9)	
Widow	14	01 (7.1)	13 (92.9)	
Divorced	29	09 (31.0)	20 (79.0)	
Type of Marriage				0.342
Monogamous	50	08 (16.0)	42 (84.0)	
Polygamous	117	58 (49.6)	59 (50.4)	

Analysis of data and results according to possible risk factors that might predispose to the infection is shown in Table 5. Those that claimed to be HIV positive had higher IgM seroincidence 100% compared to those that claimed to be negative 22.7%. There was statistical significant association between HIV status and HPV infection (χ^2= 10.812, df= 1, p= 0.002). Those who claimed to be HIV positive were more likely to be infected with HPV than those that are negative (OR=4.168, 95% C.I=4.114-12.730). The participants with multiple sexual partner had the higher IgM seroincidence rate of 46.2% compared those with single sexual partner 18.5%. There was statistical significant association between sexual partner and HPV seroincidence (χ^2= 1.231, df= 1, p= 0.006) and those with multiple sexual partner were almost two times more likely to be infected than those with single sexual partner (OR=1.709, 95% C.I=1.970-3.412). The participants who claimed not to use condom had higher IgM seroincidence 38.7% compared to those who use condom 18.5%. There was no statistically significant association between the use of condom and HPV seroincidence (χ^2= 2.154, df= 1, p= 0.395). However,participants with multiparous had higher IgM seroincidence rate of 41.6% while lower seroincidence were recorded among those with Primiparous 20.8%. There was statistical significant association between parity and HPV seroincidence (χ^2= 1.001, df= 1, p= 0.000) and those with multiparous parity are more prone to HPV infection(OR=2.098, 95% C.I=2.098-3.412).The participants whose age at sexual debut greater or equal to 15years had higher IgM seroincidence rate of 50.5% and there was statistical significant association between age at sexual debut and HPV seroincidence (χ^2= 7.741, df= 1, p= 0.001) as well those with age above 15years are more confer to risk for HPV infection (OR=1.765, 95% C.I=1.765-3.412).Participants who claimed to have certain STI had higher IgM seroincidence rate of 65.6% but no statistical significant association observed between STI status and HPV seroincidence (χ^2= 11.551, df= 1, p= 0.921). A statistical significant association between smoking and HPV infection was recorded in this research (χ^2= 2.620, df= 1, p= 0.009) and those that smoke are more prone to HPV infection and possible cervical cancer development (OR=3.331, 95% C.I=0.782-4.916). Although the study shows no significant association between use of contraceptive and HPV infection (χ^2= 3.258, df= 1, p= 0.888) but higher IgM seroincidence was recorded among those that claimed to use contraceptives 76.2% compared to those that claimed not to use 24.3%. Presence of Co-wife shows statistical significant association with HPV seroincidence (χ^2= 6.008, df= 1, p= 0.005) likewise those with Co-wife are much more confer with the possibility of coming down with HPV infection (OR=3.331, 95% C.I=0.254-5.662). Presence of other malignancy (χ^2= 3.018, df= 1, p= 0.000), number of children (χ^2= 4.223, df= 1, p= 0.016) and organ transplantation (χ^2= 7.103, df= 1, p= 0.011) are all statistically significant associated with HPV infection and participants with those variables are more prone to HPV infection.

Table 5: Serological survey of Oncogenic Human Papillomavirus Infection in relation to risk factors among the participants in Katsina State, Nigeria

Variables	Total	IgM			
		Positive (%)	Negative (%)	P-value	Odd ratio
HIV Status					
Positive	32	32 (100)	0 (0.00)	0.002*	4.168
Negative	150	34 (22.7)	116 (77.3)		
Sexual Partners					
Single	65	12 (18.5)	53 (81.5)	0.006*	1.709
Multiple	117	54 (46.2)	63 (53.8)		
Use of condom					
Yes	32	08 (25.0)	24 (75.0)	0.395	1.442
No	150	58 (38.7)	92 (61.3)		
Parity					
Nulliparous	33	09 (27.3)	24 (72.7)	0.000*	2.098
Primiparous	24	05 (20.8)	19 (79.2)		

Multiparous	125	52 (41.6)	73 (58.4)		
Age at sexual debut					
≥ 15 years	109	55 (50.5)	54 (49.5)	0.001*	1.765
≤15 years	73	11 (15.1)	62 (84.9)		
STI Status					
Presence	64	42 (65.6)	22 (34.4)	0.921	2.734
Absence	118	24 (20.3)	94 (79.7)		
Smoking					
Yes	45	43 (95.6)	02 (4.4)	0.009*	3.331
No	137	23 (16.8)	114 (83.2)		
Use of Contraceptives					
Yes	42	32 (76.2)	10 (23.8)	0.888	4.556
No	140	34 (24.3)	106 (75.7)		
Presence of Co-wife					
Yes	122	56 (45.9)	66 (54.1)	0.005*	4.111
No	60	10 (16.7)	50 (83.3)		
Presence of other malignancies					
Yes	62	62 (100)	00 (0.0)	0.000*	1.231
No	120	04 (3.3)	116 (96.7)		
Number of Children					
0-3	23	05 (21.7)	18 (78.3)	0.016*	2.030
3-5	76	32 (42.1)	44 (57.9)		
5 and above	68	29 (42.6)	39 (57.4)		
Organ transplantation					
Yes	02	02 (100)	0 (0.0)	0.011*	1.890
No	180	64 (35.6)	116 (64.4)		

**= Statistically significant at 95% confidence interval (i.e.≤0.05)*

Analysis of data and results according to clinical symptoms observed is shown in Table 6. Those that have no vaginal bleeding had higher seroincidence compared to those without vaginal bleeding. There was statistical significant association between vaginal bleeding and HPV infection (χ^2= 1.912, df= 1, p= 0.011).

Participants with vaginal discharged had higher seroincidence of 44.8% compared to those without vaginal discharged. Although a significant high seroincidence was recorded on vaginal discharged, burning sensation and pelvic pain but no statistical significant association between vaginal discharged, burning sensation and pelvic pain and HPV infection in this study. Those that have claimed to experience pain during sexual intercourse had higher seroincidence rate of 78% compared to those that experience no pain 2.0%. There was statistical significant association between pain during sex and HPV infection (χ^2= 1.912, df= 1, p= 0.032).

Table 6: Serological survey of Oncogenic Human Papillomavirus infection in relation to observed clinical symptoms of the participants in Katsina State, Nigeria

Factors	**Total**	**Immunoglobulin-M**		
		Positives (%)	**Negative (%)**	**P-value**
Vaginal bleeding				0.011*
Yes	61	18 (18.0)	43 (82.0)	
No	121	48 (39.7)	73 (60.3)	
Vaginal discharged				0.255
Yes	58	26 (44.8)	32 (55.2)	
No	124	40 (32.3)	84 (67.7)	
Burning sensation				0.119
Yes	58	00 (0.0)	58 (100)	
No	124	66 (53.2)	58 (46.8)	

Pelvic pain				0.342
Yes	50	28 (56.0)	22 (44.0)	
No	132	38 (28.8)	94 (71.2)	
Pain during sex				0.032*
Yes	82	64 (78.0)	18 (22.0)	
No	100	02 (2.0)	98 (98.0)	

**= Statistically significant at 95% confidence interval (i.e.≤0.05)*

Findings according to awareness and uptake of cervical cancer screening is shown in Table 7. Those that have no awareness of the screening had higher seroincidence 50.0% compared to those with awareness 9.7%. Furthermore, those that had the screening had higher seroincidence 48.8%, but no statisticalsignificant association between awareness of the screening with HPV infection (χ^2= 6.012, df= 1, p= 0.511). Both reasons given by the participant for doing (χ^2= 13.058, df= 2, p= 0.025) and not doing (χ^2= 9.118, df= 3, p= 0.011) the screening are statistically significantly associated with HPV infection.

Table 7: Serological survey of Oncogenic Human Papillomavirus infection based on awareness and uptake of cervical cancer screening in Katsina State, Nigeria

Variable	Total	Immunoglobulin-M			
		Positives (%)	Negative (%)	X^2	P-value
Awareness of the screening					
Yes				0.654	0.511
No	62	06 (9.7)	56 (90.3)		
	120	60 (50.0)	60 (50.0)		
Had the screening					
Yes	43	21 (48.8)	22 (51.2)	13.282	0.077
No	139	45 (32.4)	94 (67.6)		
Reasons for doing the Screening				2.453	0.025*
Doctors request	32	12 (37.5)	20 (62.5)		
Free	03	01(33.3)	02 (66.7)		
Self-conviction	08	03 (37.5)	05 (62.5)		
Reasons for not doing the screening				7.100	0.011*
Its painful	15	05 (33.3)	10 (66.7)		
Expensive	14	06 (42.9)	08 (57.1)		
Embarrassing	26	11 (42.3)	15(57.7)		
Healthy	88	18 (20.5)	60 (68.2)		

**= Statistically significant at 95% confidence interval (i.e.≤0.05)*

IV. Discussion

In the present study, an overall high seroincidence indicate that infection with HPV appears to be silent and unnoticed in the study area and knowledge of the mode of transmission of the virus also appears to be limited and hence facilitates the spread of the virus in the population. This might be because many of the lesions might be mild and insufficiently troublesome for those positive patients to seek for medical attention under conditions where medical facilities are scarce and home treatment of self-limiting conditions is common as earlier postulated (Alhamlan *et al.*, 2017). Hence, these infected patients are carriers of HPV and might continue to be source of the virus in the community. The HPV seroincidence of 36.3% is high, compared to the adjusted global HPV seroprevalence of 10.4% and 11.7% reported by Burchell *et al.* (2006) and Bruni *et al.* (2010) respectively. This high rate is an indication of continuous transmission of the infection and hence the importance of implementation of measures for the control of the spread of the virus and its resultant sequel in Nigeria. This findings is higher than some previous Nigerian literatures (Nejo *et al.*, 2018; Kennedy *et al*., 2016; Isa *et al.*, 2013). However, some studies on HPV infection in Nigeria have reported higher prevalence than this study(Kabuga*et al*., 2013; Maryam *et al.*, 2018; Manga *et al.*, 2015). The difference in the reported HPV rates in Nigeria may be due to various factors such as sensitivity of HPV assay used, different study population with varying exposures to different risk factors based on diverse socio-cultural differences Nwenke *et al.* (2013).

The finding showed highseroincidencerate among pregnant women 45.2% which is higher than 10% reported by Kennedy *et al.* 2016 but lower than 48.1% by Manga *et al.* 2015. This higher seroincidence among pregnant women emphasizes the possible risk cervical cancer development as well congenital infection of the neonates as previously postulated by Alhamlan *et al.,* 2017. This higher seroincidence rate when published would draw the attention of governments on the importance of providing and including HPV diagnosis as part of routine antenatal care Nigeria.

It's not surprising that higher seroincidence rate 44.1% was obtained in Turai Yar adua Maternal and Children hospital which higher than 26.3% reported by Okolo *et al.,* 2010. This could be due to the fact that all of the participants from that Hospital are pregnant enrollees and this findings reported a significant association between pregnancy and HPV infection. Higher seroincidence rate in the senatorial zones shows the possibility of sexual promiscuity which increases the rate of the HPV infection (Alhamlan *et al.,* 2017) and also widespread of polygamy and early marriage (Manga *et al.,* 2015) in Katsina central.

Even though HPV infection were detected across all the age groups but higher in old age. This can be explained by the fact that HPV infections persist for life, the seroincidence increases with age through the sexually-active years. In line with the present study, study in Nigeria by (Isa*et al.,* 2013) have shown a statistically significant association between HPV infection and age of the participants. However, majority of the participants are in 21-30 years age group indicating there suitability for screening enrolment in future prevention of cervical cancer (Gage *et al.,* 2012).

Furthermore, non-of the sociodemorgraphic factor found to be associated with the seroincidence rate of HPV infection which corroborate with the findings of (Thomas *et al*., 2004; Kennedy *et al.,* 2016). It is interesting to note that there was consistently high seroincidence of HPV infection irrespective of educational status in this study which agrees with (Botha*et al.,* 2015; Omoare *et al.,* 2016). Women with high levels of education were found to have a higher risk of HPV infection which contradict some studies of (Manga *et al.,* 2015; Akarolo-Anthony *et al.,* 2013). Higher educational level of women is generally associated with increased in attitude towards HPV and its preventive measures with minimal risk factors for the infection (Chang *et al.,* 2013; Manga *et al.,* 2015) The seroincidence was observed to be higher in married participants compared to single participants as agreed by (Omoare *et al.,* 2016). This may likely be due to active sexual life and multiple sex partners and probably extramarital affairs among the married participants.The higher rate of HPV infection found among women in a polygamous relationship in this study may be because polygamy has been reported to be a factor in the spread of sexually transmitted infections like HPV (Rousseau *et al.,* 2003). The risk of HPV infection has been reported to increase with increase in the number of wives within a family (Bayo *et al*., 2002). The result of this study is consistent with the findings of Xi *et al.,* (2003).

A study Kano, Nigeria re-confirmed the statistical significance of parity, sexual partner and use of contraceptives as risk factors for HPV infection (Auwal *et al.,* 2013). Also in conformity with this findings, Thomas *et al*., (2004) and Sarma *et al*., (2013)all reported HIV infection, Smoking, Age at sexual debut as significant risk factors for HPV infection (Manga *et al.,* 2915). In contrast to this findings, Kennedy *et al*., 2016 reported the Malignancy as not important risk factor for HPV infection. Higher seroincidence in relation to use of condomin this study rises a concern regarding the poor quality of the condom used by the participants. In addition, the participants may had probably acquire the virus through non-sexual routes.

There was no significant level of awareness of cervical cancer screening. This could be due to the fact morethan half of the participant have low level of education and women with low level of education were found be prone to acquisition of HPV infection (Akarolo-Anthony *et al.,* 2013).Another possible reason for low level of awareness among women may be because of less attention given by government and other funding bodies to provide routine screening for HPV infection and Cervical cancer screening in most of the Hospitals in Nigeria even among Antenatal care attendees like as in other sexually transmitted infections. This higher seroincidence rate of 50.0% among those that are not aware of the screening indicate the urgent need of public education by advocacy organization to contained the level of spread of HPV infection and curtail the possibility of cervical cancer development.

The low patronage of the screening reported in this study indicate the non-established general screening programmes in hospitals and other important institutions and even in urban and rural areas of developing countries as reported by some literatures (Alhamlan *et al.,* 2017; Audu*et al.,* 2014; Udigwe, 2006; Claeys*et al.,* 2002). This low level of awareness and patronage reported in this study is in contrast with the data from developed countries with market economy and established standard computerized screening programs where the uptake is generally high (Klug *et al.,* 2005; Lee-Lin *et al.,* 2007; Alhamlan *et al.,* 2017).

V. Conclusion

Anoverall high seroincidence rate of HPV infection recorded in the study was 36.3the % and also 33.2%. Pregnant women recorded a high seroincidence rate of 45.2% and there was significant association between pregnancy and HPV infection in this findings. Katsina senatorial zone recorded the higher

seroincidence rate 40.0% of HPV infection. None of the sociodemorgraphic factors analysed in this study shown a significant association with HPV infection. Risk factors found to be associated with HPV infection include HIV status, Sexual partner, Parity, Age at sexual debut, smoking, presence of co-wife and malignancy, large number of children and organ transplantation. Out of the clinical symptom observed only vaginal bleeding and pain during sex had significant association with HPV infection.

VI. Recommendations

This study recommends that public awareness campaigns and perception target programs should be conducted to scale-up cervical cancer screening in the Katsina state and Nigeria at large. It is also recommend that targeted studies among other communities to compare the incidences and prevalence of HPV infection should be conducted further. Molecular studies should also be done to fully study and characterized the oncogenic genes. Government and other funding bodies should strategized and fully provide general vaccination programs for young women of age 9-13years as recommended by WHO.

Acknowledgements

The authors wish to acknowledge complete financial sporponsoship given by Tertiary and education trust fund (TETFund) Institution based research through Umaru Musa Yar adua University Board of Research. We also appreciate the inputs from Prof Maryam Aminu Mukhtar of Microbiology Department ABU Zaria and Prof Oyero S.K. of University of Jos,Nigeria.

Reference

[1]. **Akarolo-Anthony, S.N., Famooto, A.O., Dareng, E.O., Olaniyan, O.B., Offiong, R., Wheeler, C.M. andAdebamowo, C.A.** 2014. Age-specific prevalence of human papilloma virus infection among Nigerian women. *BMC Public Health, 14*(1): 656.

[2]. **Alhamlan, F.S., Ali S, Shaihana A.A., and Mohammed N.A.** 2017. Human papillomaviruses: The cervical cancer saga in developing countries,*Journal of Infection in Developing Countries*; 11(11):819-825.

[3]. **Audu BM, Bukar M, Ibrahim AI, and Swende T.Z.** 2014. Awareness and perception of human papilloma virus vaccine among healthcare professionals in Nigeria. *Journal of Obstetrics and Gynecology*; 34:714–717.

[4]. A**uwal, I.K., Amin, M. Atanda, A.T., Tukur, J. andSarkinfada, F.** 2013. Prevalence and risk factors of high risk human papillomavirus infections among women attending gynaecology clinics in Kano, northern Nigeria. *Bayero Journal of Pure and Applied Sciences*, *6*(1): 67-71.

[5]. **Bayo, S., Bosch, F.X., de Sanjosé, S., Muñoz, N., Combita, A.L., Coursaget, P., Diaz, M., Dolo, A., van den Brule, A.J., and Meijer, C.J.** 2002. Risk factors of invasive cervical cancer in Mali. *International Journal Epidemiology*, *31*(1): 202–209.

[6]. **Borchell AN, Winer RL, De Sanjose S, andFranco EL**. Epidemiology and transmission dynamics of genital HPV infection.Vaccine. 2006 Aug 31; 24(S3): 52-61.

[7]. **Botha MH, van der Merwe FH, Snyman LC, and Dreyer G.** 2015. The Vaccine and Cervical Cancer Screen (VACCS) project: Acceptance of human papillomavirus vaccination in a school-based programme in two provinces of South Africa. *South African Medical Journal*; 105(1):40-43.

[8]. **Bruni, L., Barrionuevo-Rosas, L., Albero, G., Aldea, M., Serrano, B., Valencia, S., Brotons, M., Mena, M., Cosano, R., Muñoz, J., Bosch, FX., Sanjosé, S and de, Castellsagué, X.** ICO Information Centre on HPV and Cancer (HPV Information Centre). 2015. Human Papillomavirus and Related Diseases in Nigeria: Summary Report 2015-12-23.

[9]. **Centers for Disease Control and Prevention.** STD curruculum for clinical educators. Genital Human papillomavirus. 2012:1–37.

[10]. **Chang IJ, Huang R, He W, Zhang S-K, Wang S-M, and Zhao F-H.** 2013. Effect of an educational intervention on HPV knowledge and vaccine attitudes among urban employed women and female undergraduate students in China: a cross-sectional study. BMC Public Health;13:916.

[11]. **Claeys, P., Gonzalez, C., Gonzalez, M., Page, H., Bello, R.E. and Temmerman, M.** 2002. Determinants of cervi- cal cancer screening in a poor area: Results of a popula- tionbased survey in Rivas, Nicaragua. *Tropical Medicine and International Health*, **7**, 935-941.

[12]. **Ferlay J, Shin HR, and Bray F, GLOBOCAN**. 2008, cancer incidence and mortality worldwide: IARC Cancer Base number 10. Lyon, France: International Agency for Research on Cancer; 2010. http://globocan.iarc.fr (accessed Aug 10, 2010).

[13]. **Gage JC, Ajenifuja KO, Wentzensen NA, Adepiti AC, Eklund C, and Reilly M.** 2012. The age-specific prevalence of human papillomavirus and risk of Cytologic abnormalities in rural Nigeria: Implications for screen-and-treat strategies. International Journal of Cancer; 130:2111–2117.

[14]. **IsaI.A., Owoeye, O. Ibukun G, and Kalada M.** 2013.Cervical cancer screening among female undergraduates and staff in the Niger delta region of Nigeria.*Open Journal of Obstetrics and Gynecology*, 3:61-66.

[15]. **Kennedy NT, Ikechukwu D, andGoddy B.** 2016. Risk factors *&* *D*istribution of oncogenic strains of human papilloma virus in women presenting for cervical cancer screening in Port Harcourt, Nigeria. *The Pan African medical journal*. 2016; 23:85.

[16]. **Klug, S.J., Hetzer, M. and Blettner, M.** 2005. Screening for breast and cervical cancer in a large German city: Par- ticipation, motivation and knowledge of risk factors. *European Journal of Public Health*, 15, 70-77.

[17]. **Lee-Lin, F., Pett, M., Menon, U., Lee, S., Nail, L., Mooney, K. and Itano, J.** 2007. Cervical cancer and Pap test screening practices among Chinese-American immi- grants. *Oncology Nursing Forum*, **34**, 1203-1209.

[18]. **Manga M.M., Adeola F, Yusuf M.A., Aliyu U.E., Danladi B.A., Hamidu U.P., Rasheed A.B. and Abimbola O.O.** 2015. Epidemiological patterns of cervical human papillomavirus infection among women presenting for cervical cancer screening in North-Eastern Nigeria. Infectious Agents and Cancer; 10:39.

[19]. **Nejo, Y.T., Olaleye, D.O. and Odaibo, G.N.** 2018. Prevalence and risk factors for genital human papillomavirus infections among women in southwest Nigeria. *Archives of Basic & Applied Medicine, 6*(1), 1-12.

[20]. **Nwenke, IG., Banjo, AAF., Abdulkareem, FB., Nwadike, VU.**2013. Prevalence of Human Papilloma virus DNA in HIV positive women in Lagos University Teaching Hospital (LUTH) Lagos, Nigeria. British Microbiology Research Journal. New Delhi.

[21]. **Okolo C, Franceschi S, Adewole I, Thomas JO, Follen M, and Snijders PJ.**2010. Human papillomavirus infection in women with and without cervical cancer in Ibadan, Nigeria. Infect Agent Cancer;5:24.

[22]. **Rousseau M.C., Abrahamowicz, M., Villa, L.L., Costa, M.C., Thomas, E., Rohan, T.E., and Franco, E.L.** 2003. Predictors of Cervical Co-infection with Multiple Human Papillomavirus Types. *Cancer Epidemiology, Biomarkers and Prevention*. *12*(10): 1029–1037.

[23]. **Sarma U, Mahanta J, Borkakoty BJ, Talukdar KL, Gogoi R, and Yadav K.** 2004**.** Demographic Characteristic of HPV Infection in Women - A Hospital Based Study from Guwahati, India. *National Journal of Medical Research*. *3*(1):1–4.

[24]. **Sarmakaddam, S.B. and Gerald, S.G.** 2006: Validity of Assumption while determining sample size. *Indian Journal of Community Medicine*. *29*(2): 2004-2006.

[25]. **Thomas JO, Herrero R, Omigbodun AA, Ojemakinde K, Ajayi IO, Fawole A, Oladepo O, Smith JS, Arslan A, Munoz N, Snijders PJ, Meijer CJ,andFranceschi S.** 2004. Prevalence of papillomavirus infection in women in Ibadan, Nigeria: a population-based study. *British Journal Cancer*; 90:638–645.

[26]. **Udigwe, G.O.** 2006. Knowledge, attitude and practice of cervical cancer screening (Pap smear) among female nurses in Nnewi, South Eastern Nigeria. *Nigerian Journal of Clinical Practice*, **9**, 40-43.

[27]. **Xi, L.F., Toure, P., Critchlow, C.W., Hawes, S.E., Dembele, B., Sow, P.S., Kiviat, N.B.** 2003. Prevalence of specific types of human papillomavirus and cervical squamous intraepithelial lesions in consecutive, previously unscreened, West-African women over 35 years of age. *International Journal of Cancer*, 103:803–809.

Abdulkadir B. "Epidemiological pattern of Immunological makers and possible risk factors associated with naturally selected high risk group for Oncogenic Human Papilloma Virus Infection in Katsina State, Nigeria." *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, 10(1), 2021, pp. 07-16.