

**Short Communication****Open Access****Prevalence and distribution of cervical high-risk human papillomavirus infection in a rural community of Edo State, Nigeria**¹Okoequale, J., ^{*2}Samuel, S. O., ³Amadi, S. C., ¹Njoku, A., and ¹Okome, G. B. O.¹Department of Obstetrics and Gynaecology, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria²Department of Medical Microbiology, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria³Department of Obstetrics and Gynaecology, Rivers State University Teaching Hospital, Port Harcourt, Nigeria*Correspondence to: samuelolowo2003@gmail.com**Abstract:**

Background: Human papillomaviruses (HPVs) are non-enveloped, double-stranded DNA viruses and most women in the world are probably infected with at least one type of the virus during their sexual life. Oncogenic HPVs are predominantly sexually-transmitted pathogens and several high-risk types are associated with nearly all cases of cervical cancer worldwide. In view of paucity of data on the prevalence and distribution of various high risk HPV subtypes, this study was carried out to provide evidence based local data for cervical cancer preventive programs within this region.

Methodology: This was a descriptive cross-sectional study involving 145 consenting women living in Ugbegun rural community of Edo central senatorial district, Edo State, Nigeria. Informed consent of each participant was obtained and socio-demographic information collected through interviewer-administered collection tool. Cervical swab sample was collected using the female cervical cell collection kit for HPV DNA testing. HPV DNA was detected by the Hybridio 21 HPV Geno array test kit which uses polymerase chain reaction (PCR) amplification and flow through hybridization assay. Summary statistics were presented as mean, standard deviation, median, frequency and proportions as appropriate using the Statistical Package for the Social Sciences (SPSS) version 22.0. Association of socio-demographic characteristics of the women with HPV prevalence was done using the 't' test, with *p* value less than 0.5 considered statistical significance.

Results: Twenty four of the 145 women tested positive, giving HPV prevalence of 16.6%. Six HPV serotypes were detected; types 16, 18, 35, 45, 52 and 58. HPV types 16 and 18 were most frequent, contributing 54.2%, and co-infection occurred in 29.2%. HPV-positive women had significantly higher mean number of life time sexual partners ($p=0.046$) and mean parity ($p=0.0001$) compared to HPV-negative women. The mean age of the women ($p=0.710$), mean age at menarche ($p=0.570$) and mean age at coitarche ($p=0.940$) were not significantly associated with prevalence of HPV

Conclusion: This study showed predominance of oncogenic cervical HPV types 16 and 18 within this sub region of rural Nigeria. Strengthening reproductive and sexual education in both males and females with focus on HPV vaccination, delaying sexual activities and reduction in number of child birth are strategies which could prevent high risk HPV infection and cervical cancer in rural communities.

Keywords: high-risk; cervical; HPV; rural community; prevalence

Received Apr 16, 2022; Revised Sept 5, 2022; Accepted Sept 19, 2022

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Prévalence et répartition de l'infection cervicale à haut risque par le virus du papillome humain dans une communauté rurale de l'État d'Edo, au Nigéria¹Okoequale, J., ^{*2}Samuel, S. O., ³Amadi, S. C., ¹Njoku, A., et ¹Okome, G. B. O.¹Département d'Obstétrique et de Gynécologie, Hôpital Universitaire Spécialisé d'Irrua, Irrua, État d'Edo, Nigéria²Département d'Microbiologie Médicale, Hôpital Universitaire Spécialisé d'Irrua, Irrua, État d'Edo, Nigéria³Département d'Obstétrique et de Gynécologie Hôpital Universitaire de l'État de Rivers, Port Harcourt, Nigéria*Correspondance à: samuelolowo2003@gmail.com

Résumé:

Contexte: Les papillomavirus humains (VPH) sont des virus à ADN double brin sans enveloppe et la plupart des femmes dans le monde sont probablement infectées par au moins un type de virus au cours de leur vie sexuelle. Les VPH oncogènes sont principalement des agents pathogènes sexuellement transmissibles et plusieurs types à haut risque sont associés à presque tous les cas de cancer du col de l'utérus dans le monde. Compte tenu du manque de données sur la prévalence et la distribution de divers sous-types de VPH à haut risque, cette étude a été réalisée pour fournir des données locales fondées sur des preuves pour les programmes de prévention du cancer du col de l'utérus dans cette région.

Méthodologie: Il s'agissait d'une étude transversale descriptive impliquant 145 femmes consentantes vivant dans la communauté rurale d'Ugbegun du district sénatorial central d'Edo, dans l'État d'Edo, au Nigeria. Le consentement éclairé de chaque participant a été obtenu et les informations socio-démographiques ont été collectées via un outil de collecte administré par l'intervieweur. Un échantillon d'écouvillon cervical a été prélevé à l'aide du kit de collecte de cellules cervicales féminines pour le test ADN du VPH. L'ADN du VPH a été détecté par le kit de test Hybridio 21 HPV Geno array qui utilise une amplification par réaction en chaîne par polymérase (PCR) et un test d'hybridation en flux continu. Les statistiques sommaires ont été présentées sous forme de moyenne, d'écart-type, de médiane, de fréquence et de proportions, selon le cas, à l'aide de la version 22.0 du package statistique pour les sciences sociales (SPSS). L'association des caractéristiques sociodémographiques des femmes avec la prévalence du VPH a été réalisée à l'aide du test «*t*», avec une valeur de *p* inférieure à 0,5 considérée comme une signification statistique.

Résultats: Vingt-quatre des 145 femmes ont été testées positives, ce qui donne une prévalence du VPH de 16,6 %. Six sérotypes de VPH ont été détectés ; types 16, 18, 35, 45, 52 et 58. Les types de VPH 16 et 18 étaient les plus fréquents, contribuant à 54,2%, et une co-infection s'est produite dans 29,2%. Les femmes séropositives pour le VPH avaient un nombre moyen de partenaires sexuels ($p=0,046$) et une parité moyenne ($p=0,0001$) significativement plus élevés que les femmes séronégatives pour le VPH. L'âge moyen des femmes ($p=0,710$), l'âge moyen à la ménarche ($p=0,570$) et l'âge moyen à la coïtarche ($p=0,940$) n'étaient pas significativement associés à la prévalence du VPH.

Conclusion: Cette étude a montré la prédominance des types de VPH cervicaux oncogènes 16 et 18 dans cette sous-région du Nigeria rural. Le renforcement de l'éducation reproductive et sexuelle chez les hommes et les femmes en mettant l'accent sur la vaccination contre le VPH, le report des activités sexuelles et la réduction du nombre de naissances sont des stratégies qui pourraient prévenir les infections à VPH à haut risque et le cancer du col de l'utérus dans les communautés rurales.

Mots-clés: à haut risque; cervical; VPH; communauté rurale; prévalence

Introduction:

Human papillomaviruses (HPVs) are non-enveloped, double-stranded DNA viruses. These viruses are ubiquitous and most women in the world are probably infected with at least one type of the virus during their sexual life, with a point prevalence rate of 10.1% (1,2). Genital HPV types are categorized, according to epidemiologic association with cervical cancer and oncogenic potentials, as low risk types (6, 11, 41, 44), and high-risk types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 68) (3).

Oncogenic HPVs are predominantly sexually-transmitted pathogens and several high-risk types are associated with nearly all cases of cervical cancer worldwide. Cervical cancer is the second most common cancers in women constituting about 12% of all cancers. Globally, 80% of new cases of cervical cancer occur in the developing countries, but conversely only 5% of women in these countries have ever had preventive screening test such as HPV typing. The impact and threat of cervical cancer to the lives of women worldwide is indisputable (4,5).

The need for prevention of HPV-associated cancers in developing countries cannot be

over-emphasized. On a nationwide basis, HPV vaccination still remains a veritable option in prevention of cervical cancer. In the absence of HPV vaccination or improvements in screening and treatment framework, deaths due to cervical cancer is projected to rise significantly.

There are few studies in Nigeria that have evaluated the prevalence and distribution of various high risk HPV subtypes (6,7). In view of the paucity of information on this, it was necessary to conduct this study to provide evidence based local data for decision making which would be useful in devising the optimum strategy for HPV vaccination and other cervical cancer preventive programs within this region of Edo State, Nigeria.

Materials and method:

Study setting, design and participants

This was a descriptive cross-sectional study of 145 women from Ugbegun community of Esan central senatorial district in Edo State, Nigeria conducted in April 2021. The study participants included non-menstruating women who were 18 years and above, living within the selected rural community.

Sample size determination:

The sample size was calculated using the formula for cross sectional study (8); $n = Z^2pq/d^2$, where 'n' is the sample size, 'Z' is standard normal deviation (1.96), 'p' is the proportion of subjects positive for high-risk HPV which is taken as 21.6% (0.216) based on a previous study (9), 'q' is 1-p (1-0.216=0.784) and 'd' is the assumed observed difference at 5% (0.5) level of significance. This gave the calculated sample size of 71, which was increased to 145 to increase the power of the study.

Sampling technique

The sampling method employed was multistage sampling technique. Esan central is made up of four clans and villages which include Irrua (as the administrative headquarter), Ewu, Opoji and Ugbegun kingdoms. Irrua was excluded because it has been designated as an urban community (10). Simple random sampling by ballot without replacement was used to select one of the remaining three communities, and Ugbegun community was selected as the rural community for the study.

Community engagement and participant recruitment

By local custom, community meetings were held prior to recruitment. This was done after a proper community entry through the opinion leaders and the women leaders with proper explanation of the purpose of the research. The study days and times were advertised throughout the communities through 'word-of-mouth'. On the study days, potential participants arrived at a community healthcare centre and were voluntarily recruited into the study.

Informed consent and data collection:

Women who agreed to participate in the study had their informed consent obtained after due explanation. Interviewer obtained informed consent was done in the privacy of an interview room. A printed consent form was translated verbally by a trained investigator into the local language and read to the study participant in some cases. The interview was then administered in a private area. Socio-demographic information of each participant was obtained using a design data collection form.

Specimen collection and laboratory analysis:

Each consenting participant entered a private examination room, where pelvic examination and cervical specimen collection were performed by the attending medical doctor trained for the study. Cervical swab sample was collected using the female cervical cell collection

kit for HPV DNA testing.

The residual cell suspensions from the female cervical cell collection kit were frozen at -20°C and transported to molecular diagnostic laboratory, Nigeria Limited, Lagos State, Nigeria, in iced cold packs for analysis. HPV DNA was detected using the Hybribio 21 HPV Geno array test kit which uses polymerase chain reaction (PCR) amplification and flow through hybridization (9).

Data analysis

Statistical analysis of data was done using the Statistical Package for the Social Sciences version 22.0 software. The mean and standard deviations were calculated for quantitative variables, while charts, graphs and tables were used to depict qualitative variables. The Chi-square test was used to compare the differences between proportions while Students' 't' test was used to compare the mean differences between continuous variables. P value less than 0.5 was considered statistical significance.

Results:

The mean age of the 145 women studied was 37.0±13.0 years. Majority (66.2%) of the women did not have tertiary level of education, and 54% were married in monogamous setting (Table 1).

Table 1: Socio-demographic characteristics of participants

Socio-demographic variables	Frequency (%) (n=145)
Age group (years)	
18 - 24	23 (15.9)
25 - 34	54 (37.2)
35 - 44	29 (20.0)
45 - 54	15 (10.3)
≥ 55	24 (16.6)
Mean age (± SD) in years	37.193 ± 13.01
Education status	
No Education	11 (7.6)
Primary	33 (22.7)
Secondary	52 (35.9)
Tertiary	49 (33.8)
Marital status	
Single	39 (26.9)
Married	80 (55.1)
Divorced	0
Separated	12 (8.3)
Widowed	14 (9.7)
Marital setting	
Single	35 (24.1)
Monogamy	78 (53.8)
Polygamy	32 (22.1)

A total of 24 women tested positive, giving HPV prevalence rate of 16.6% in the

study. Six HPV serotypes; 16, 18, 35, 45, 52 and 58 were detected (Table 2). HPV subtypes 16 and 18 were most frequent types, contributing 54.2% (14/25). Co-infection occurred in 29.2% (7/24) of these women who tested positive for high-risk HPV infection. Serotype 45 did not occur in isolation, but coexisted with other high-risk HPV subtypes as shown in the Table 2.

Table 2: Distribution of high-risk HPV subtypes

HPV serotypes	Number (%) of HPV positive women	
Viral serotype	16	9 (37.5)
	18	4 (16.7)
	16,18	1 (4.2)
	35	4 (16.7)
	16, 45	3 (12.5)
	45, 52	2 (8.3)
	45, 58	1 (4.2)
Total	24 (100)	

HPV = human papillomavirus

HPV-infected women had significantly higher mean number of life time sexual partners ($p=0.046$) and mean parity ($p=0.0001$) compared to those who were HPV negative (Table 3). The age of the women ($p=0.710$), age at menarche ($p=0.570$) and age at coitarche ($p=0.940$) were not significantly associated with prevalence of HPV

Table 3: Statistical analysis of socio-demographic characteristics of high-risk HPV-positive and HPV-negative women

Socio-demographic variables	Mean \pm SD values of women		p-value
	Positive	Negative	
Age in years	31.0 \pm 12.6	38.6 \pm 14.1	0.710
Age at menarche	13.3 \pm 1.0	15.4 \pm 1.0	0.570
Age at coitarche	18.3 \pm 1.7	21.1 \pm 2.8	0.940
Sexual partners	3.7 \pm 1.1	2.7 \pm 1.5	0.046*
Parity	2.4 \pm 2.0	1.2 \pm 2.7	0.0001*

SD=Standard deviation; * = statistically significant; HPV=human papillomavirus

Discussion:

The prevalence of high-risk HPV infection in this study was 16.6%, which is similar to the study from southwest Nigeria with 21.6% reported in Ile-Ife (9), but at variance with the study from Kano, northcentral Nigeria which reported 76% (11). A similar study conducted in Mali reported a prevalence of 12% (12). The International Agency for Research on Cancer (IARC) surveys of HPV in various countries described inconsistent trends in HPV infections in Africa (13), consistent with the finding in our study and those of others in Nigeria, hence the need for more studies in various geographical

regions of the world.

The viral serotypes identified in this study were types 16, 18, 35, 45, 52 and 58. HPV subtypes 16 and 18 were the most frequent subtypes with 54.2%. This is worrying, considering the oncogenic potential of these two subtypes, as over 70% of cervical cancer cases have been attributed to infections with these two subtypes. Type 45 did not occur in isolation but coexisted with other HPV types. In Mozambique, HPV serotype 35 was found to be slightly higher than HPV 16 among women without cervical cancer (14).

It has been established that transmission of HPV is predominantly by sexual contact. Early sexual debut and multiple sexual partners are known risk factors, while other routes have been shown to be of lesser significance (15). In our study, sexual activities irrespective of the number of partners and higher parities were significantly associated with positive high-risk HPV infection.

Conclusion:

Our study showed predominance of oncogenic HPV types 16 and 18 within this sub-region of rural Nigeria. Strengthening reproductive and sexual education in both males and females with focus on HPV vaccination, delaying sexual activities and reduction in number of child birth are strategies which could prevent high-risk HPV infections and cervical cancer in these communities.

Contributions of authors:

OJ and SSO conceptualized the study; OJ and ASC performed literature search; OJ and NA collected the cervical specimens; NA and OJ collected the participants data; SSO and OJ performed the laboratory works; OJ, ASC, OGBO and SSO were involved in the write-up and review of the manuscript. All authors agreed to the final manuscript draft submitted.

Source of funding:

Authors received no external fundings

Conflict of interest:

No conflict of interest is declared

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