Original Research Article

Liquid-based cytology profile of street sex workers in Benin City, Edo State, Nigeria

.

ABSTRACT

Aim: To investigate the liquid-based cytology profiles of the street sex workers in Benin City, Edo State, Nigeria.
Study design: Analytical cross-sectional study
Place and Duration of Study: Department of Medical Laboratory Science, Histopathology Sub-Department, University of Benin, Benin City and the Histopathology Laboratory, University of Benin Teaching Hospital (UBTH)., between December 2016 and May 2017
Methodology: This study was conducted in the local government areas that make up the Benin metropolitan City in Edo State.A simple random sampling method was used to recruit the 113 participants, after which the questionnaire was used as the data gathering tool. The liquid-based cytology method was used for sampling following the cervix examination by a gynecological nurse. Data were analyzed using Frequency tables, and factor analysis using Minitab version 17.0 and the statistical significance was set at $p < 0.05$.
Results: From a total of 113participants within the street sex workers ring in Benin City, acute cervicitis was predominant 7/113(6.2%) closely followed by the chronic 4/113(3.5%). The prevalence of SSWs living with cervicitis in Benin City 11/113(9.7%) revealed that Teenage SSWs were 5/113 (4.4%) and Migrant SSWs 11/113 (9.7%) and were affected by age and duration of sexual practices ($p= 0.583$; $p= 0.204$). The prevalence of HPV sera-positivity revealed that 3/113(2.7%) is infected and is largely distributed amongst the age group 21-30years. A hundred percent (100%) of the SSWs agreed to having heard about condoms and have been using it; while regular condom usage was revealed in the HPV sera-negative group amounting to 101/110 (92%) and 2/3(66.7%) amongst the HPV sera-positive group
Conclusion: In conclusion, cervicitis is the only cervical lesion observed in the street sex workers with HPV infection predominantly affecting the age group (21-30years). Also, teenage prostitution is on the increase and HPV infection amongst the street sex workers in Benin City, Nigeria.

Keywords: Liquid-based cytology, street sex workers, Benin City, Edo State

1. INTRODUCTION

Sex work is a term used to describe a wide range of activities relating to the exchange of money (or its equivalent) for the provision of a sexual service [1]. Individuals may occasionally and opportunistically exact a fee or gift for a sexual favour without perceiving themselves to be sex workers, or they may engage in the full-time commercial provision of sex services [2]. Sex workers may be male, female, or transgendered, and the boundaries of sex work are vague, ranging from erotic displays without physical contact with the client, through to high risk of unprotected sexual intercourse with numerous clients [2]. However, the present study focused majorly on female sex workers (FSWs) and is characterized either as street FSWs or resident FSWs. A street FSW is a female prostitute, who stands out at different locations for advertising sexuality for patronage. Resident FSWs, in turn, are

women prostitutes that are resident in a particular identifiable brothel or hotel strictly for commercial sex [3,4]. According to Ladipo et al.[5] a brothel is a residential 'quarters' for sex workers habitation, where sex services are obtained or sold. It is also, important to note that brothels are in highly populated areas especially townships offer more potential customers than those located on the outskirts.

Very few women in sub-Saharan Africa are ever screened for cervical cancer needless to think of female sex workers who are increasingly afraid of stigmatization. In a study among medical workers in a Ugandan hospital (doctors, nurses and medical students) only 19% of the female medical workers had ever had a cervical cancer screening test done. The reasons for not having been screened included: not feeling at risk, lack of symptoms, carelessness, fear of vaginal examination, lack of interest, the test being unpleasant and not yet being of risky age [6]. In many societies today, due to the variety of social and legal discriminatory issues, sex workers are usually poorly identified and do not have regular Pap smears or other routine health check-ups. In recent years in a country like Iran, voluntary counseling, and testing (VCT) centers have been offering services to women at high risk due to their sexual behaviour; however, a significant number of them still have not been identified for screening [7]. Regular screening exercise among the commercial sex workers could help in early detection of the cervicitis, which could progress into cervical cancer if there is no early medical intervention.

Before this research, empirical data on cervicitis screening of the street sex workers in Benin City remains completely unavailable while most available studies deal majorly on the global perspectives thereby leaving out the regional and sub-regional areas relatively unexplored. Benin City in Nigeria is one of such area where street sex work is prominent and yet, no effort so far by researchers to looking into this neglected aspect of the social deviancy by the female sex workers [4]. Therefore, there is a need for the screenings of the street sex workers who are occupationally exposed to cervical lesions, which may become cancerous if unawares. To the best of our knowledge, this study may be the first to screen the street sex workers using the liquid-based cytology method especially in Benin metropolis, Edo State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Areas

This study was conducted in the local government areas that make up the Benin metropolitan City in Edo State. The Ovia South-west, in which, Iguobazuwa is the headquarters. It is about 30 minutes' drive from Benin City. Ovia Northeast where Okada is the Local Government Headquarters, in which, Igbinedion University is located and about 45-minute drive from Benin City. Ikpoba-Okha, where Idogbo is the headquarters, in which Benson Idahosa University is located. It has an area of 862 km² and a population of 371,106. Egor Local Government Area, in which, Uselu is the headquarters and is the home to the royal seat of the heir to the Benin monarch [8, 9,10, 3]

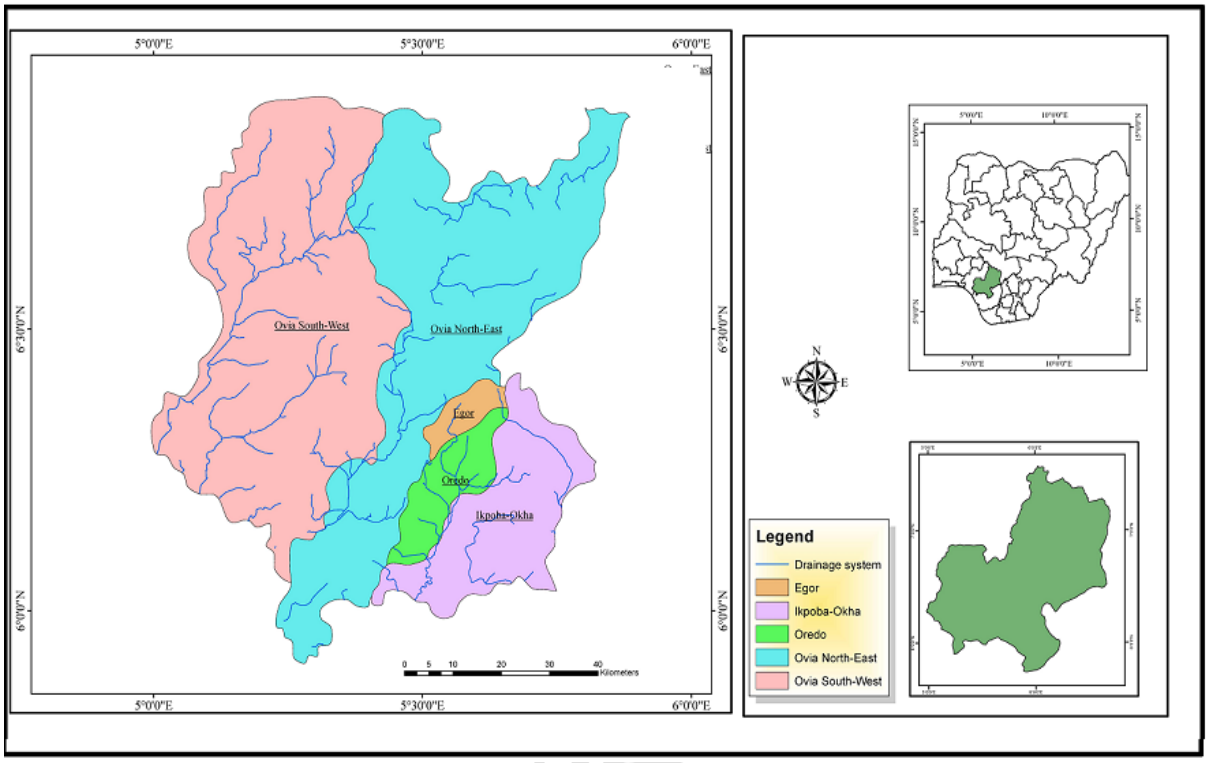

Figure 1: Showed map of the study site (Ikpoba-okha, Egor, Oredo, Ovia Northeast and some part of Ovia Northwest adopted from Odigie and Achukwu, [4].

2.2 Study Population

The survey identified as many streets sex workers (SSWs) by the local government areas, in which they operate. Although, the study population was considered floating, as the relocation of SSWs was inevitable.

2.3 Sample Size Determination

The sample size was determined using Fisher's formula for a cross-sectional study:

$N = Z^2 PQ/d^2$,
where N is the desired sample size,
Z is the standard normal deviation (1.96), and
P is the proportion of the target population estimated to have a particular characteristic.
A prevalence of 16.5% was obtained from a similar study [11]
$n=4 X 0.165 (1-0.165)/0.05^2$.
Hence, n= 4*0.165*0.835/0.0025 amounting to (n=220). However, 113 participants from the street sex worker's business were recruited from the 4 LGAs in Benin City. The reason for the short fall was partly due to the nature of the street sex worker's business as they are always out for monetary gains. Hence, it became very difficult to get the willingness of the proposed participants without inducement. Secondly, due to the time frame allocated for the completion of this study.

2.4 Data Collection

A simple random sampling was undertaken among street sex workers in Benin City, Nigeria following an established method adopted by researchers from similar studies in the locality [8, 10,3]. The SSWs were surveyed using a structured questionnaire, which was completed on a voluntary basis and conducted in vernacular (Pidgin English) where necessary [4]. The interview segment offered predominantly multiple-choice options, and open-ended questions [10]. The data centred on socio-demographics: educational background, health-care-seeking behaviours, sexual experience as reported by Odigie and Odega, [8] including viral disease history. It also included a variety of issues regarding sexual practices, number of sexual contacts and history of current and former symptoms [10]. The illiterate participants were assisted to filling the questionnaires, whereas the literates were left to deal with the research questions without interference.

2.5 Method of Samples Collection

A trained gynaecological nurse in University of Benin Teaching Hospital collected the cervical samples using liquid-based cytology method following a referral from the point of first contact after being self-convinced to participate. Prior to this, a consultant gynaecologist examined the cervix for any lesion or inflammation. A clinical sign, potentially indicating cervicitis, e.g., cervical discharge, pus on the cervical swab, bleeding after sampling, and the inflammatory cervix were documented. The sample collections by LBC involved the use of a speculum for inspection of the cervix for any pus or inflammation prior to the sampling [8,10]. Briefly, liquid-based cytology (LBC) (SurePath™; BD TriPath, Burlington, N.C. USA) consists of a broom like sampling device called the cervix brush. The device was used for the collection of cervical smear majorly from the transition zone while in some cases from the endocervix (Chandran et al 2021; [10]. After sampling, the device was detached and aseptically lowered into a preservative vial for further processing in the laboratory (Efosa &Uwadiegwu 2015; [10]

2.6 Laboratory Estimations

Cervical smear was prepared in the laboratory according to the manufacturer's instruction for LBC samples. Slide processing for cytopathology examination was carried out using the Cytospin (IEC 61010 Thermo Scientific Cytospin 4, GMI, Inc.USA). Samples preparation, processing, and staining were conducted within 4-6 hours of the samples collected, while the leftover samples were refrigerated at 4^{o}C for further testing where necessary. Staining of the smears were according to the Papanicolaou modified emergency method and the simplified alternative Papanicolaou methods respectively [14,3,15]

2.6.1.1 Protocols for the Simplified Alternative (SAM) Method

The Simplified Alternative Papanicolaou (SAP) Method**,** otherwisereferred to as the Odigie's method was also used in this study for comparison. Briefly, alcohol grades were replaced by a single 0.5% glacier acetic acid, while the differentiation with 1% acid-alcohol was excluded. Harris haematoxylin for nuclear staining was preheated to 45°C in a hot oven before staining for rapid penetration, dehydrating alcohol grades were replaced with 0.5% glacier acetic acid, while, the cytoplasmic stains (OG6 and EA50) were mixed in equal proportions after a separate preparation. Two changes of 95% alcohol were also replaced by 0.5% glacier acetic acid for 15 seconds [15,10].

2.6.1.2 Liquid-Based Cytology Staining Protocol

0.5 % glacier acetic acid – (15 seconds)
Harris Haematoxylin preheated to 45°c (2 minutes)

Wash in tap water (30 seconds)
0.5 % acetic acid – (15 seconds)
OG6 + EA56 in equal proportion (1minutes 45seconds)
0.5 % acetic acid – (15 seconds)
Ethanol (1minute) and Xylene (1minute) Mount in D.P.X. The MEM protocol was adopted from an earlier study by (Odigie and Obaseki, [14], Odigie et al.[3], Odigie and Achukwu, [10].

2.6.1.3 Human Papillomavirus (HPV) Smears Diagnosis

The Digene HC2 High-Risk HPV DNA Test (Digene Corporation, 1201 Clopper Road, Gaithersburg, MD 20878 Maryland, USA) was used according to the Manufacturer's instruction to show the presence or absence of the genetic (DNA) material from the Human Papillomavirus (HPV) in LBC (Pap) smears. Briefly, the refrigerated vial containing the smear was thawed in a water bath for 10minutes. Approximately 40ul of the smear was reconstituted by adding 1-2drops of the buffer solution contained in the Kit. Each specimen was mixed thoroughly but gently and about 2-3 drops of the mixed solution was aseptically dispensed into the HPV test cassettes. The HPV test cassette was left on the bench while the reaction was watched for a change in colour shades within 3-10minutes.

2.6.1.4 Microscopy and Photomicrography

The slides review was conducted blindly by the histopathologists at the University of Benin Teaching Hospital (UBTH), Benin City, using the Swift Binocular Microscope® with an inbuilt lighting system and white films with an Olympus photomicroscope® (Opticshot- 2; Nikon, Tokyo, Japan) at x10 and x40 magnifications respectively.

2.7 Data Analysis

The results were coded, double-entered and cross-checked using Epi info software. Cronbach's Alpha was employed for the reliability testing of the questionnaires. Data were analyzed using Frequency tables, Logistic Regression, Chi-Square test, Test of proportionality, t-test and Factor analysis using Minitab version 17.0. The statistical significance was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

Table 1: **Distribution of Cervicitis-infected SSWs amongst various Age groups (n=113)**

Age groups	Acute (%)	Chronic (%)
< 20	2(1.8%)	0(0%)
21-30	5(4.4%)	3(2.7%)
31-40	0	1(0.8%)
> 40	0	0
Total	7(6.2%)	4(3.5%)

Table 2: **Socio-demographic/ Economic and Behavioural Characteristics of SSWs (n=231)**

Parameters	HPV sera-negativity (n=110)	HPV sera positivity (n=3)
Mean age	28.4years	28.9years
Mean working duration as SSW	12.84 months	23.16 months
Frequency of Sex work (mean per day)	3.75 per day	4.22 per day
Regular condom usage	101/110 (92%)	2/3 (66.7%)

Teenage SSWs infected with cervicitis 5/113 (4.4%)

Migrant SSWs infected with cervicitis 11/113 (9.7%)
Teenage SSWs in the study population = 27/113 (23.9%)
Migrant SSWs in the study population = 81/113 (71.7%)
Teenage SSWs infected with HPV= 2/113(1.8%)
Migrant SSWs infected with HPV= 3/113 (2.7%)

Note: Migrant SSWs are referred to as street sex workers who are not primarily resident in Benin City but had travelled down to Benin for the purpose of sex working so as to be properly discrete about their identity. Teenage street sex workers on the other hand are below the age of consent, which is regarded in this study as ages below 16years.

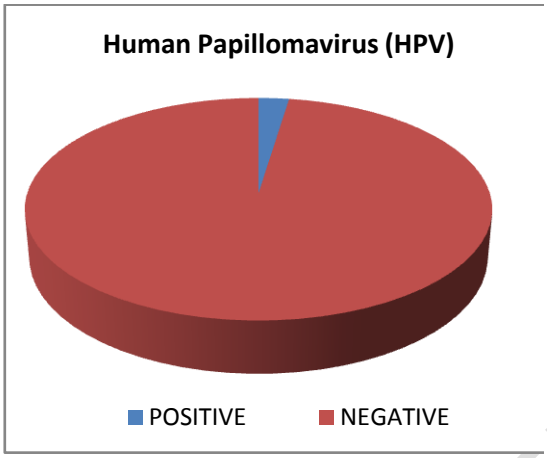

Figure 2: **Showed the Pie chart representation for HPV sera-positivity**

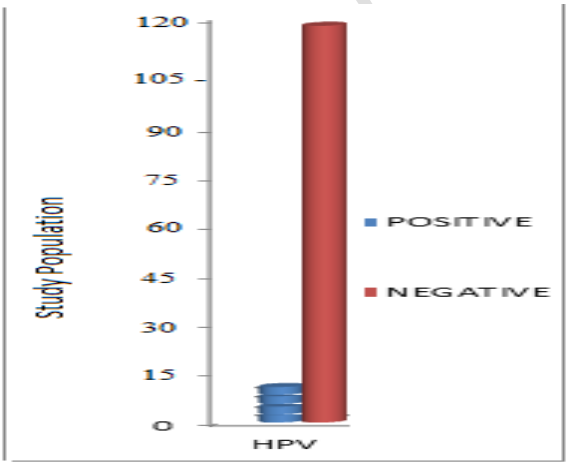

Figure 3: **Showed the Bar Chart Representation for HPV-infected SSWs in the Study Population.**

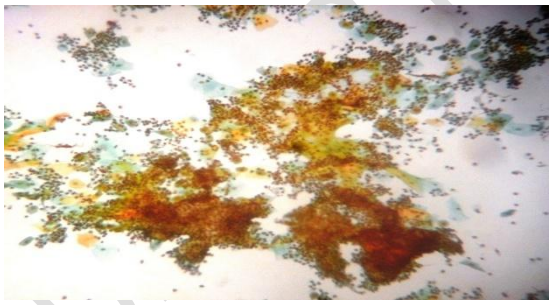

Plate 1: **Acute Cervicitis stained with the Odigie's Modified Papnicolaou Staining Method at X10 Magnifications**

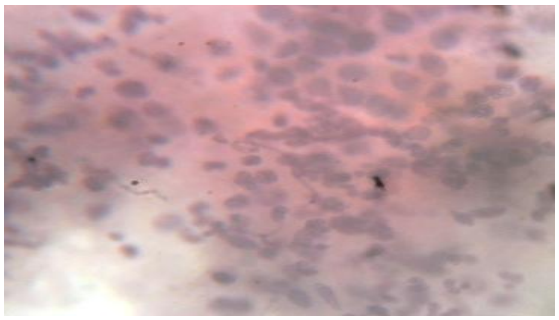

Plate 2: **Chronic Cervicitis stained with Richard's Modified Method (Same slide as above) at X40 Magnification.**

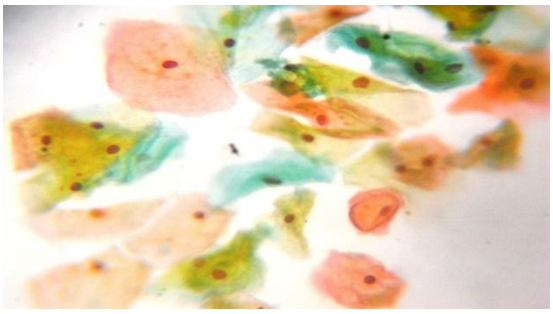

Plate: 3:Normal cervical smear cytology stained the re-modified Papnicolaou Staining Method at x40 magnifications (Odigie and Obaseki, 2014).

All the SSWs encountered and recruited in this study were a particular type of commercial sex workers that are plying their sexual escapades explicitly on the roads, event places, clubs and beauty parlours. Though sex work has been legalised in most countries of the world, but the law rarely protects sex workers in some nations and even in the advanced/ developed countries of the world. Street commercial sex workers are often stigmatized by the society, which has contributed to their vulnerability to HPV infection apart from the already established risk factors in notable journals [16].

In the present study, cervicitis was the only cervical lesion seen in street sex workers screened in Benin City, Nigeria. Cervicitis is a common condition within the Nigerian commercial sex worker's ring and in the context of very low STI rates is predominately of non-specific cervicitis rampaging the commercial sex worker's populations. This finding may not be generalizable to other populations of CSW, particularly those with higher rates of STI, but encourage further evaluation of the etiologies and treatment of cervicitis in commercial sex workers terrain. The result from this study aligns with those published by Pollett *et al.,2013* [17], stating that only a few of the CSWs in their study had cervicitis, second only to vaginal discharge as the most common syndrome. The present study is also in agreement with a study in Peru where cervicitis was predominantly non-*gonococcal*, non-*chlamydial* in aetiology, and no pathogen was detected in cervical samples in over 90% of cervicitis infected participants (Pollett *et al.,*2013)[17]. Cervicitis that is not associated with chlamydial or gonococcal infections is the most common type of cervicitis overall and is referred to as 'non-specific cervicitis' (Lusk et al.,2016). [18].

The rate of non-specific cervicitis determined here was similar to those reported in non-commercial sex working women (Lusk*et al, 2018*) [19]. Studies in some commercial sex worker's populations have demonstrated a strong association between *gonococcal*, *chlamydial* or Trichomonas infection with clinical manifestations of cervicitis (Pepin *et al. 2005,*. [20]; However, no such association was found in the street sex workers studied in Benin City. The deviant report may be due apparently to the number of sample size and the refusal of some SSWs to participate in the study, which have been observed in a similar study and have been reported [3]. Other potential reasons for the high frequency of non-specific cervicitis and lack of association with typical cervicitis-causing organisms may include ongoing inflammation of the cervix after previously treated chlamydial or gonorrhoeal infections, perhaps mediated by an abnormal immune response [19] Unfortunately, data were not collected on prior antimicrobial treatment for cervicitis or other genital tract syndromes in SSWs, which could lead to a significant limitation to this study. Similarly, a non-observation of data for prior antimicrobial treatment for cervicitis has been reported

[20,17]. Data were also not collected on the use of spermicides or frequency of douching in this study. Cervical irritation due to douches and spermicides may have, however, contributed to the non-specific cervicitis rates observed and have also been reported [19].

Human papillomavirus virus (HPV) is the main cause of cervical cancer, which after breast cancer, is the second most prevalent cancer in the world among women. HPV has more than twenty types; the types that occur in the genital tract are predominantly acquired through sexual intercourse, and up to 50% of sexually active women will be infected at some time [21,22]. The prevalence of HPV among women in the general population varies by geographical region. Similarly, there is variability in the prevalence of HPV by geographic region from different countries, which ranges from 2.14% to 20% [23]. The highest prevalence of HPV has been described in commercial sex workers (CSWs). Sexual contact with CSWs in some communities is believed to contribute to HPV transmission and the high prevalence of cervical cancer in most countries [24]. The increased risk of HPV observed in CSWs has been attributed to younger age, low educational status, high frequency of sexual contacts and unsafe sexual behaviour [25]. There is currently limited information on HPV infections from the street sex worker's ring ranging from one country to another. However, the present study determined the prevalence rate of HPV and its related risk factors among SSWs, which showed a 3/113(2.7%) prevalence and was found to be near like other studies and especially a recent study conducted in Chennai, India; where (3%) of the commercial sex workers were diagnosed of human papillomavirus by Sathiyalatha et al.[26].

The findings of this study do not conform with those of Shikovaet al. [26], where the estimated prevalence rate of HPV was found to be 20.1%, which was nearly nine times higher than that of the street sex workers from Benin City. HPV types 16 and 18 are considered as high-risk HPV types for cervical cancer, which constituted approximately 95% of the identified HPV types in this study and is in accordance with other studies [25,26]. In another development from Turkey, the HPV prevalence rate was reported to be 13% in CSWs, and the most frequently observed type was type 16 [27]. The rate in our study was far lower than what was reported in Bulgaria having 43.4% and 31.6% in Australia [22, 24]. The lower rate could reflect the smaller proportion of the SSWs of younger ages and relatively fewer sexual contacts in the study group. The differences also might be explained using different HPV assays in circulation as well as the various methods used in different laboratories [28].

In this study, the street sex workers (SSWs) who participated in the HPV screening and have their data documented showed a severe reduction in rate of HPV infections affecting the street sex workers in this part of the country, Benin City, Nigeria. A critical evaluation showed an encouraging consistency with results across the globe and some parts of the country where it thus, illustrates the range of structural changes and sustainability of responses based on the parties most responsible for developing and implementing HPV risk reduction efforts for sex workers at large [29,30,31,32, 33]. The present result on HPV intervention was also compared to the nature of intervention targets by the Edo State Ministry of health, which illustrates that street sex workers in Benin City are relatively not informed and are therefore not aware of the health implications of being infected by HPV compared to the levels of awareness for HIV 1/ 2 in recent times. The nature and level of responses to HPV infection among street sex workers appeared to reflect the priorities and knowledge/ awareness of the dreaded disease and in turn, imparts a difference in the levels of structural change that are achieved in this study compared to other states in Nigeria where higher prevalence was recorded [10].

This study revealed that migrants and teenage street sex workers are prevalent in Benin City (Table 2). This study therefore conforms to a previous report by Odigie and Odega, [8], who

revealed a rising percentage of the teenage and migrant resident commercial sex workers in Oredo, Egor and IkpobaOkha local government areas respectively. Although, the little difference observed may be due in parts to the type of sex working that has been sampled and is thought to be negligible. Recall that the present study sampled strictly on street sex workers reporting 5/113 (4.4%) in favour of the teenage SSWs and 11/113 (9.7%) for the migrant SSWs in compares to the later report by Odigie and Odega[8] with a prevalent of 4.9% and 9.9% for teenage and migrant resident commercial sex workers. In addition, this study disagrees with the report by Odigie and Achukwu[10], where a whopping 10.6% teenage and 33.8% migrant resident sex workers in Enugu State, Nigeria were revealed. The differences may be attributed to geographical location and the pattern of sex working between the former (this study) and the latter by Odigie and Achukwu[10]. In buttress of the foregoing, geographical location and type of sex working as a factor for the increased or decreased responses to commercial sex worker's interventions have been reported by Odigie *et al.,*[15][4].

4. CONCLUSION

Acute cervicitis is majorly ravaging the street sex workers in Benin City and is predominantly affected by age and duration of sexual practices (p= 0.583; p=0.204); while human Papilloma viral infection is prevalent amongst age group (21-30years) in Benin metropolitan street sex business.

CONSENT

Participants were street sex workers, who take commercial sex work as a sole occupation for a livelihood. They were adequately briefed on the research protocols, while informed consent was obtained prior to recruitment and subsequently for sampling. The informed consent form that was used for this study was explicitly explained to the participants in English, vernacular and in their local dialect where possible.

ETHICAL APPROVAL

Ethical Clearance permitting the conduct of this study was approved by the Edo State Ministry of Health (Research and Ethics Committee) with Protocol number (HA. 577/Vol. 11. 165).

REFERENCES

1. Balfour, R. and Allen, J. A Review of the Literature on Sex Workers and Social Exclusion. UCL Institute of Health Equity for Inclusion Health, Department of Health, UK. 2014
2. Harcourt, C. and Donovan, B. The many faces of sex work. *Sexually Transmitted Infectio,* 2005; 81(3): 201-206.
3. Odigie, B.E., Achukwu, P.U., Atoigwe, B.E., Obaseki, D.E., Usunobun, J.O., Bello, M.E. and Omorodion, N. Model Formulation using Adaptive Neuro-fuzzy Inference Systems (ANFIS) for Cervical Lesions (CL): A Case Study of Commercial Sex Workers (CSWs) Predict Diagnosis. University of Benin Academic Research Day (UBARD) presentation, (2nd Edition), Book of proceedings. University of Benin Printing Press, Ekehuan Campus, Benin City, Nigeria, 2016a; p225-9.
4. Odigie, B.E. and Achukwu, P.U. Comparing Trio-Modified Papanicolaou staining Methods for Assessing Liquid-Based Cytology Samples. *American Journal of Biomedical Science*, 2017; 6(5): 22-7.

5. Ladipo, L., Akinyemi, Z., Emmanuel, J. and Ankomah, A. National Behavioral Survey: Brothel Based Sex Work in Nigeria. Society for Family Health, Abuja. 2001.
6. Mutyaba, T., Mmiro, F. and Weiderpass, E. Knowledge, attitudes and practices on cervical cancer screening among the medical workers of Mulago Hospital, Uganda. *BMC Medical Education*, 2006; 6(1):13-9.
7. Vafaei, H., Asadi, N., Foroughinia, L., Salehi, A., Kuhnavard, S., Akbarzadeh, M., Ravanbod, H.R., Mohamadalian, F. and Kasraeian, M. Comparison of abnormal cervical cytology from HIV positive women, female sex workers, and the general population. *International Journal of Community Based Nursing and Medicine*, 2015;3(2):76-83.
8. Odigie, B.E. and Odega, K.I. Cervicitis amongst teenage sex workers in Benin metropolis, Nigeria: the viewpoint of the cytologist.*African Journal of Cellular Pathology,* 2013;1(1):34-9.
9. Egharevba, J. O., &Asikihia, M. O. (2018). Original Research Article A Trend Analysis of the Utilisation of Post Offices in Benin City, Edo State, Nigeria.
10. Odigie., B.E. and Achukwu, P.U. Cytopathological Examination and Epidemiological Study of Cervicitis in Commercial Sex Workers (CSWs) in Coal City (Enugu), Nigeria.*Ethiopian Journal of Health Sciences,* 2015;25(3): 227-32.
11. Kwok, A. W., Gong, J. S., Wang, Y. J., Leung, J. C. S., Kwok, T., Griffith, J. F., & Leung, P. C. (2013). Prevalence and risk factors of radiographic vertebral fractures in elderly Chinese men and women: results of Mr. OS (Hong Kong) and Ms. OS (Hong Kong) studies. *Osteoporosis International*, *24*, 877-885.
12. Chandran, V., Sumithra, M. G., Karthick, A., George, T., Deivakani, M., Elakkiya, B., ... & Manoharan, S. (2021). Diagnosis of cervical cancer based on ensemble deep learning network using colposcopy images. *BioMed Research International*, *2021*.
13. Efosa, O. B., & Uwadiegwu, A. P. (2015). Cytopathological examination and epidemiological study of cervicitis in commercial sex workers (CSWs) in Coal City (Enugu), Nigeria. *Ethiopian Journal of Health Sciences*, *25*(3), 225-230.
14. Odigie, B.E. and Obaseki, D.E. Conventional Pap technique (CPT) in comparison to the modified emergency method (MEM) in cytodiagnosis of Pap smear and fine needle aspiration cytology specimens. *Annals of Biomedical Sciences*, 2014; 13(2):23-30.
15. Odigie, B.E., Achukwu, P.U., Atoigwe, B.E., Odega, K.I., Omorodion, N.T. andErameh, O.T. Simplified Alternative Papanicolaou Method for Cyto-diagnosis of the Papanicolaou and Liquid-Based Cytology Smears: A follow-up study of Odigie's Technique. University of Benin Academic Research Day (UBARD) presentation, (2nd Edition), Book of proceedings. University of Benin Printing Press, Ekehuan Campus, Benin City, Nigeria, 2016b; p230-234.
16. Moeen, U.D., Irum, S., Umaira, Z., Mahwish, T., Muhammad, A., Ejaz, A.K., Muhammad, S.R. Knowledge, Attitude and Practices of Female Sex Workers about HIV/AIDS prevention in Lahore, Pakistan. *International Journal of Perceptions in Public Health,* 2017; 1(2): 148-56.
17. Pollett, S., Calderon, M., Heitzinger, K., Solari, V., Montano, S. M., &Zunt, J. (2013). Prevalence and predictors of cervicitis in female sex workers in Peru: an observational study. *BMC Infectious Diseases*, *13*, 1-7.
18. Lusk, M. J., Garden, F. L., Rawlinson, W. D., Naing, Z. W., Cumming, R. G., & Konecny, P. (2016). Cervicitis aetiology and case definition: a study in Australian

women attending sexually transmitted infection clinics. *Sexually transmitted infections*, *92*(3), 175-181.

19. Lusk, M. J., Garden, F. L., Cumming, R. G., Rawlinson, W. D., Naing, Z. W., & Konecny, P. (2017). Cervicitis: a prospective observational study of empiric azithromycin treatment in women with cervicitis and non-specific cervicitis. *International journal of STD & AIDS*, *28*(2), 120-126.
20. Pepin, J., Labbé, A. C., Khonde, N., Deslandes, S., Alary, M., Dzokoto, A., ... & Frost, E. (2005). Mycoplasma genitalium: an organism commonly associated with cervicitis among west African sex workers. *Sexually transmitted infections*, *81*(1), 67-72.
21. Bosch, F.X., Burchell, A.N. and Schiffman, M. Epidemiology and natural history of human papillomavirus infections and type-specific implications in cervical neoplasia. *Vaccine,* 2008; 26: 1–16.
22. Tideman, R. L., Thompson, C., Rose, B., Gilmour, S., Marks, C., Van Beek, I., ... & Mindel, A. (2003). Cervical human papillomavirus infections in commercial sex workers—risk factors and behaviours. *International journal of STD & AIDS*, *14*(12), 840-847.
23. Ersan, G., Kose, S., Senger, S. S., Gunes, H., Sehirali, S., & Gurbuz, I. (2013). The prevalence and risk factors of human papillomavirus in female sex workers. *The Eurasian journal of medicine*, *45*(1), 16.
24. Shikova, E., Todorova, I., Ganchev, G., Kouseva-Dragneva, V., &Kalascheva-Zaimova, P. (2011). Prevalence of human papillomavirus infection among female sex workers in Bulgaria. *International journal of STD & AIDS*, *22*(5), 278-280.
25. Del Amo, J., González, C., Belda, J., Fernández, E., Martínez, R., Gómez, I., ... & Ortiz, M. (2009). Prevalence and risk factors of high-risk human papillomavirus in female sex workers in Spain: differences by geographical origin. *Journal of Women's Health*, *18*(12), 2057-2064.
26. Sathiyalatha, R. (2013). *Prevalence of Cervical Cancer and the Effectiveness of Cancer Awareness Package on Knowledge Regarding Cervical Cancer among Women in adopted Communities of Omayal Achi Community Health Centre* (Doctoral dissertation, The Tamilnadu Dr. MGR Medical University, Chennai).
27. Akcalı, N., Nazlıcan, E., Akbaba, M., Okyay, R. A., & Nayir, T. (2017). Knowledge, attitudes and behaviors of sex workers about cervical cancer in a brothel from Adana. *Çukurova Medical Journal*, *42*(1), 41-47.
28. Engesæter, B., van Diermen Hidle, B., Hansen, M., Moltu, P., Staby, K. M., Borchgrevink-Persen, S., ... & Christiansen, I. K. (2016). Quality assurance of human papillomavirus (HPV) testing in the implementation of HPV primary screening in Norway: an inter-laboratory reproducibility study. *BMC Infectious Diseases*, *16*(1), 1-8.
29. Kumar, K., Jha, P., Arora, P., Mony, P., Bhatia, P., Millson, P., Dhingra, N., Bhattacharya, M., Remis, R.S. and Nagelkerke, N. Trends in HIV-1 in young adults in south India from 2000 to 2004: a prevalence study.*Lancet,* 2006; 367(9517): 1164-72.

30. Halperin, D.T., E.A. Demoya., E. Pérez-Then., G. Pappas., J.M. Garcia-Calleja. Understanding the HIV epidemic in the Dominican Republic: a prevention success story in the Caribbean. Journal of Acquired Immune Deficiency Syndrome, 2009;51(S1): S52-S9.
31. Hawkes, S., Collumbien, M., Platt, L., Lalji, N., Rizvi, N., Andreasen, A., Chow, J., Muzaffar, R., Ur-Rehman, H., Siddiqui, N., Hasan, S. and Bokhari, A. HIV and other sexually transmitted infections among men, transgenders and women selling sex in two cities in Pakistan: a cross-sectional prevalence survey. *Sexually Transmitted Infection,* 2009;85(S2): S8-S16.
32. Kolawole, O.M., Amuda., O.O., Nzurumike, C., Suleiman, M.M. and Ogah, J.I. Seroprevalence and Co-Infection of Human Immunodeficiency Virus (HIV) and Herpes Simplex Virus (HSV) Among Pregnant Women in Lokoja, North-Central Nigeria.*Iran Red Cross Medical Journal,* 2016;18(10): e25284.
33. Odigie, E. B., & Achukwu, P. U. (2018). Regular condom use tends to decrease cervical lesions in resident-commercial sex workers in Sub-Saharan Africa. *UniversaMedicina*, *37*(1), 39-49.