Comparison between Visual Inspection Using Acetic Acid and Papanicolaou Smear in Cervical Cancer Screening in A Nigerian Sub-Rural Population

Mojeed Momoh[1], Jedidiah Buraimoh Afekhobe[1], Reuben Agbons Eifediyi[1,*], Governor Okome[1], Joseph Eigbefoh[1], Chris Owobu[2] and Felix Omorogbe[1]

[1]*Department of Obstetrics and Gynaecology, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria and College of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria*

[2]*Department of Histopathology, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria and College of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria*

Abstract: *Background:* Cervical cancer is an important reproductive health concern and is the second most common cancer in women worldwide. Poorly organised health delivery system have made high coverage for cervical cancer screening using Papanicolaou smear test in most low and middle income countries difficult to achieve; leading to high cervical cancer death rate. Objective of study is to compare the accuracy of visual inspection of the cervix using 5% acetic acid which World Health Organisation have advocated for low resource countries as an available and affordable alternative, to Papanicolaou smear test as a cervical cancer screening method in a tertiary hospital serving low resource communities.

Materials and Methods: This was a comparative cross sectional study among consenting 300 women aged between 25 and 66 years attending clinics in Irrua Specialist Teaching Hospital (ISTH) and consenting female staffs of the hospital. The accuracy of *VIA* was compared with Pap smear using histopathology definitive diagnosis reports of biopsied cervical tissue as a reference.

Results: VIA had higher sensitivity and negative predictive value, 93.3% and 94.2%, and lower specificity, positive predictive value and accuracy, 57.6%, 53.8% and 69% respectively compared with Pap smear with sensitivity, NPV, specificity, PPV and accuracy, 66.0%, 84.4%, 94.2%, 85.3% and 84.6% respectively. There was significant difference between *VIA* and Pap smear accuracy; $X^2 = 8.667$, P value = 0.003 and 95% CI of 0.050 – 0.334.

Conclusion: VIA is an effective complementary or adjunctive cervical cancer screening tool to Pap smear for increased accuracy. It can also be used as a screening alternative in poor resource settings with non availability of Pap smear facility and should be incooperated as a cost effective national cervical cancer screening protocol.

Keywords: HSIL, LSIL, ASCUS, IRRUA, See and Treat Protocol.

1. INTRODUCTION

In Nigeria, the age adjusted incidence rate of cervical cancer is approximately 28.5 per 100,000 [1] and lifetime risk of developing and dying from invasive cancer is 2.1% and 1.7% respectively [1]. Sixty to eighty percent of cases presents in advanced stage cancer when it is too late to provide adequate treatment but only access palliative measures with short-term survival, as in other developing countries [2] hence the need for affordable screening methods for early detection and treatment of pre invasive cervical cancer.

Primary prevention of cervical cancer involves prevention of sexual infection with HPV among adolescents by sexual abstinence till marriage, being faithful to one partner and regular condom use. This can be achieved through health education on healthy responsible sexual behaviour. Vaccines against HPV have been developed and provide effective protection against high risk HPV types; Cervarix, Gardasil and Gardasil 9. Cervarix is a bivalent vaccine, protect against two HPV types: 16 and 18, Gardasil is quadrivalent, protects against four HPV types: 6, 11, 16 and 18 while Gardasil 9 is a nanovalent vaccine, protects against nine HPV types: 6, 11, 16, 18, 31, 33, 45, 52 and 58. They are given in three doses at 0, 2 and 6 months and are proven to be effective if given before infection with HPV. Recommended ages of vaccination are 9 to 25[3]. The HPV vaccines though available are very expensive and beyond the reach of most of the population in low resource countries such as Nigeria.

Other preventive measures include screening and treatment of premalignant cervical lesions. The largest reduction in cervical cancer incidence and mortality can be attained by increasing the coverage of women who are currently unscreened or infrequently screened.

*Address correspondence to this author at the Department of Obstetrics and Gynaecology, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria and College of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria;
E-mail: agbonsreuben@yahoo.com

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Papanicolaou (Pap) smear or test is the most widely used cervical cancer screening test in the world [4,5], for secondary prevention. Others are visual inspection using acetic acid (*VIA*), *VIA* with low level magnification (VIAM), visual inspection using Lugol's iodine (VILI) and Human Papilomavirus Deoxyribonucleic acid (HPV-DNA) testing [6]. Most developed countries like the United States of America saw dramatic reduction in the incidence and death rate from cervical cancer following the implementation of organised Pap smear screening programme. It is known to be effective in reducing the incidence of invasive cervical cancer when at least seventy percent of the population is screened on a regular basis [7]. However, this method of screening is difficult to implement in low resource countries [8] due to very limited laboratory infrastructures, pathologists and poorly organised health delivery system with patients being lost to follow up [9,10].

1.1. Objective of Research

There is no established national screening protocol in Nigeria and there is inadequate population coverage from the opportunistic and random screening programmes been carried out [11,12]. It has been estimated that only about five percent of women in developing countries have been screened for pre invasive cervical cancer compared to about eighty five percent in developed countries [13].

Staining the cervix with acetic acid during visual inspection of the cervix, is termed visual inspection using acetic acid (*VIA*). This has been advocated by World Health Organisation (WHO), as an available and affordable alternative screening method to Pap smear in developing countries in particular and in low resource communities in developed countries [14], in a screen and treat approach or single visit strategy [15,16]. The cervix is washed with 3 - 5% acetic acid (vinegar); the abnormal areas, which may be pre invasive cancer lesions, become white and can be seen with the naked eye or low magnification. *VIA* does not require highly skilled laboratory technicians or services. It is affordable, required simple application, immediate screening results, and immediate treatment with cryotherapy if indicated. These therefore reduce the need for follow up visits and the technique can easily be taught to middle and low level health care providers [17,18].

There is therefore the need to determine proportion of women with pre invasive cancer and cancer of the cervix detected by *VIA* compare to Pap smear thus determining the reliability, feasibility, acceptability and affordability of *VIA* as a screening method for cervical cancer in a tertiary healthcare centre in a low resource setting.

1.2. Justification of Research

This study was designed to compare the reliability and validity of *VIA* with Pap smear in a tertiary healthcare centre in a low resource community. This is to re-emphasise *VIA* as a simple, affordable, reliable, and suitable alternative screening method to Pap smear in the hospital for early detection of pre invasive cancer and cancer of the cervix and thereafter extend to primary and secondary healthcare centres in the surrounding communities.

2. METHODOLOGY

2.1. Study Design

This was a comparative cross sectional study.

2.2. Study Area and Population

The study was conducted in the gynaecology clinic, and pathology department of Irrua Specialist Teaching Hospital (ISTH) among women attending the gynaecology, family planning, postnatal, staff and other specialists clinics of ISTH, and among female staffs of the hospital. It serves particularly Edo central and north senatorial districts with an estimated population of 2,600,000 and also serves as a referral center for adjoining states.

2.3. Inclusion Criteria

Women of ages between 25 and 66years who're not pregnant or are more than 6weeks postpartum.

2.4. Exclusion Criteria

Women with any visible lesions or mass on visual inspection of the cervix, Women who are pregnant or 6weeks or less postpartum and Women with previous total hysterectomy.

2.5. Sample Size Determination

A sample size of 300 participants was used for the study using formula for calculating the minimum sample size when comparing proportions between two independent populations or groups [19].

2.6. Sampling Technique

A non-probability sampling technique was used in selecting participants; a purposive consecutive sampling of patients who met the inclusion criteria.

2.7. Sample Collection

Participants were counseled about cancer of the cervix, the screening procedures and objectives of the study; and were recruited after consenting. Those menstruating were advised to come back after menstruation.

Clinical data were filled on a proforma by the researcher, confidentiality was maintained by not including participants' names in the proforma, in order to elicit correct responses. Information was obtained on how they can be contacted if the result is positive, and needed to present for colposcopy directed biopsy for definitive histopathological diagnosis.

Participant was placed in the lithotomy position and the procedure was carried out. The vulva was first examined for any infection, ulcer or warts. A sterile Cusco's bivalve speculum was introduced under good lighting for examination of the vagina and cervix. The color and smell of any discharge from the cervix was noted and the discharge collected by sterile cotton swabs for microscopy, culture and sensitivity; participants with positive culture were recalled and treated with appropriate antimicrobial agent/s. The squamocolumnar junction was visualised and Ayre's spatula was used to gently scrape the ectocervix and transformation zone throughout its circumference and Pap smear taken. This was then smeared on a clean glass slide and fixed with 95% ethyl alcohol before sending to the consultant pathologist in the Pathology department of ISTH for cytology. Pap smear result was reported according to the 2001 Bethesda system as follow: negative for neoplastic cellular changes, atypical squamous cells of undetermined significance (ASCUS), low-grade intra epithelial lesion (LSIL) and high grade intra epithelial lesion (HSIL), and result was considered positive when any squamous intra epithelial lesion (SIL) was reported.

After taking the Pap smear, the cervix was then painted with a cotton wool soaked in 5% acetic acid and examined after one minute under adequate light source for acetowhite reaction. Any sharp, distinct, well defined, opaque, dense acetowhite areas with or without raised margins and suspicious whitish appearance was recorded as *VIA* positive result; area of acetowhite reaction was biopsied. Absence of acetowhite area was recorded as *VIA* negative.

Patients with abnormal Pap smear results were recalled for colposcopy directed cervical tissue biopsy. On colposcopy, saline was used to initially clean the cervical surface; vascular and surface lesions were evaluated. Abnormal vessels were examined with the aid of a green filter, then 5% acetic acid was applied. Any acetowhite lesion was noted, their intensity, speed of appearance and disappearance was noted. Findings such as dense acetowhite epithelium, sharply bordered acetowhite epithelium, dilated caliber, irregularly shaped or coiled vessels, coarse punctuation, mosaic appearance, atypical vessels and irregular surface contour if present; was noted as abnormal and indicative of cervical dysplasia.

Biopsy was taken from abnormal areas detected under colposcopy guidance using a punch biopsy forceps. Biopsied cervical tissue specimens were sent in formalin to the Consultant Pathologist of the Pathology department of ISTH where they were processed for histopathological diagnosis that was used as reference standard. Histopathology diagnosis results were reported as cervical intra epithelial neoplasia (CIN) (for pre invasive lesion) and squamous cell cancinoma (for invasive lesion). CIN is categorised with increasing severity of dysplasia as CIN1, previously known as mild dysplasia to which LSIL is equivalent; CIN2 and CIN3, previously known as moderate and severe dysplasia respectively both of which HSIL is equivalent. Patients were recalled and referred for proper follow up and appropriate management in the gynaecological clinic of ISTH. Pap smear and *VIA* results were compared with the histopathology results to determine their accuracy.

2.8. Statistical Analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) version 20 and WinPepi. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), false positive rate (FPR), false negative rate (FNR) and accuracy were calculated for Pap smear and *VIA* using the colposcopy directed biopsy histopathology results as the gold standard. The statistical difference between the validity of results from the two screening methods were ascertained using the Chi square test.

2.9. Ethical Considerations

After approval of the study protocol by the Ethics and Research Committee of the hospital, permission was obtained from the head of department of Obstetrics and Gynaecology, and head of department of Pathology. Ethical considerations in this study was based on the general ethical principles as applicable to human subjects. These are respect for persons, beneficence, non-maleficence and justice. The study participants were recruited (after signing informed consent forms) over 3months period of achieving the desired sample size that met my self objective.

3. RESULTS

During the 3 months study period, from 1st June 2015 to 31st August 2015, a total of 300 study participants, aged between twenty-five and sixty-six years who met the inclusion criteria were recruited and evaluated after signing an informed consent form. The mean, median and modal age of the participants were 41, 44 and 44 years respectively with age range of 25 – 66 years.

Participants of age 35 to 44 years were more, 116 (38.7%), half of the participants 152 (50.7%) had tertiary level of education. Most of the participants 213 (71%) were low and middle levels workers and Participants with 1 to 3 children were more 187 (62.3%). About 288 (96.0%) of participants were married and most participants, 128 (42.7%) and 139 (46.3%) participants did not specify their age of coitache and number of circumcised lifetime sexual partners respectively; however among participants that specified, most, 86 (28.7%), age of coitache was between 15 to 20 years and most 92 (30.7%) had single lifetime partners. Most of the participants 260 (86.7%) and 264 (88.0%) did not use contraception and tobacco respectively but 36 (12.0%) are exposed to cigarette smoking. Of the relatively few participants who used contraception, most [16 (5.3%)] uses oral contraceptive pills Table **4**.

More than half of the participants 156 (52.0%) were circumcised and all the participants 300 (100%) indicated that their men were circumcised. Most of the participants 180 (60.0%) were aware of cervical cancer and Pap smear screening but most of the participants 294 (98.0%) had never had a Pap smear done. Most of the participants 222 (74.0%), including some hospital workers were not aware of *VIA* as a screening method for cervical cancer.

During the 3 months study period, all 300 participants had Pap smear followed by *VIA* and participants with positive *VIA* had colposcopy directed biopsy of the aceto white lesions. Participants with abnormal/positive Pap smear results with negative *VIA* were recalled for colposcopy directed cervical biopsy; participants with abnormal histopathological results were recalled and managed appropriately.

Of the 300 cervical smears taken for screening, 16 (5.3%) participants Pap smears collection were inadequate for cytological evaluation according to the Bethesda Criteria and unsatisfactory result were gotten. These participants were recalled for repeat Pap

Table 1: *VIA* and PAP Smear Results

Result	Frequency (n) n=300	Percentage (%) 100%
VIA		
Positive (+VE)	78	26
Negative (-VE)	222	74
Pap Smear		
Normal Smear	187	62.3
Chronic cervicitis/negative for intra epithelial lesion	76	25.3
ASCUS	3	1.0
Subtotal negative (-VE)	266	88.6
LSIL	14	4.7
HSIL	14	4.7
SCC	6	2.0
Subtotal positive (+VE)	34	11.4

ASCUS: Atypical Squamous Cell of Undetermined Significance.

LSIL: Low grade Squamous Intra epithelial Lesion

HSIL: High grade Squamous Intra epithelial Lesion.

SCC: Squamous Cell Carcinoma.

smear, results were all negative for intra epithelial lesion. Pap smear was negative for intra epithelial lesion and malignancy in 266 (88.6%) cases; these include normal smear [187(62.3%)], chronic cervicitis/negative for intra epithelial lesion or malignancy [76(25.3%)], and Atypical Squamous Cell of Undetermined Significance (ASCUS), [3(1.0%)]. Pap smear was positive (abnormal) in 34 (11.4%) cases; this include Low Grade Squamous Intra epithelial Lesion (LSIL), [14(4.7%)]; High Grade Squamous Intra epithelial Lesion (HSIL) [14(4.7%)], and Squamous Cell Carcinoma (SCC) [6(2.0%)]. Of the 300 participants, 78 (26.0%) were *VIA* positive and 222 (74.0%) were *VIA* negative Table **1**.

Cervical biopsy for definitive histopathological diagnosis was done for 130 (43.3%) participants which included 86 (28.7%) participants with positive *VIA* and positive Pap smear results (of which 52 (17.3%) were *VIA* positive only, 26 (8.7%) were *VIA* and Pap smear positive and 8 (2.7%) were Pap smear positive only), and 44 (14.7%) participants with negative *VIA* and negative Pap smear results (they had cervical biopsies in order to assess the specificity, NPV and accuracy of both screening methods).

On histopathological examinations of the 130 biopsied specimens, 86 (66.2%) biopsied specimens were diagnosed as negative for intra epithelial lesion, 23 (17.7%) diagnosed as CIN I, 3 (2.3%) diagnosed as CIN II, 10 (7.7%) diagnosed as CIN III and 8 (6.2%) diagnosed as micro invasive squamous cell carcinoma Table **2**.

Of the 130 participants who had cervical biopsy, 78 participants were *VIA* positive and 52 were *VIA* negative. Of the 86 cervical biopsied specimens histopathologically diagnosed as negative for intra epithelial lesion: 37 (43.0%) were wrongly detected as positive by *VIA* (FP) and 49 (57.0%) were correctly detected as negative by *VIA* (TN). Of the 23 cervical biopsied specimens histopathologically diagnosed as CIN I: 20 (87.0%) were correctly detected as positive by *VIA* (TP) and 3 (13.0%) were wrongly detected as negative by *VIA* (FN). All 3 (100%) CIN II, 10 CIN III (100%) and 8 (100%) micro invasive Squamous cell carcinoma diagnoses were correctly detected as

Table 2: Correlation between Screening Methods and Histopathological Diagnosis

Variables n=130	Histological Diagnosis				
	Normal/ Chronic Cervicitis n=86	CIN 1 n=23	CIN 2 n=3	CIN 3 n=10	Micro Invasive Carcinoma n=8
PAP Smear					
Normal/Chronic Cervicitis. n=91	81	8	1	-	1
ASCUS n=5		2	1	1	1
LSIL n=14	4	10	-	-	-
HSIL n=14	1	3	1	9	-
SCC n=6	-	-	-	-	6
	TN=81, FP=5	TP=29, FN=15			
VIA					
POSITIVE n=78	37	20	3	10	8
NEGATIVE n=52	49	3	-	-	-
	TN=49, FP=37	TP=41, FN= 3			
***VIA* and PAP Smear n=70**					
Positive n=26	1	9	1	9	6
Negative n=44	41	3	-	-	-
	TN=41, FP=1	TP=25, FN=3			

Total Correct: PAP SMEAR(n=130): 29(TP) + 81(TN) = 110.

VIA(n=130): 41(TP) + 49(TN) =90

VIA + PAP SMEAR(n=70): 25(TP) + 41(TN) = 66.

VIA detected more positive cases(higher sensitivity) than Pap smear.

Pap smear detected more negative cases(higher specificity) than *VIA*.

Combining both increase detection accuracy.

positive by *VIA* (TP) Table **2**. Thus FP is 37; TN 49, TP 41 and FN 3, Sensitivity 93.3%, Specificity 57.6%, PPV 53.8%, NPV 94.2%, FPR 46.1%, FNR 5.8% and Accuracy 42.4% Table **3**.

Of the 130 participants who had cervical biopsy, Pap smear result was positive in 34 participants and negative in 96 participants. Of the 86 biopsied specimens histopathologically diagnosed as negative for intra epithelial lesion: 81 (94.2%) participants were cytologically detected correctly as negative for intra epithelial lesions (TN) and 5 (5.8%) participants were wrongly detected as positive for intra epithelial lesions (FP) [4 (4.6%) and 1 (1.2%) as LSIL and HSIL respectively]. Of the 23 CIN I diagnoses: 13 (56.5%) participants were correctly detected positive for intra epithelial lesion (TP) [10 (43.5%) as LSIL and 3 (13.0%) upgraded as HSIL]; 8 (34.8%) and 2 (8.7%) participants were wrongly detected as negative for intra epithelial lesion and ASCUS respectively (FN). Of the 3 CIN II diagnoses: 1 (33.3%) participant was correctly detected as HSIL (TP) and 2 (66.7%) wrongly detected as negative for intra epithelial lesion and as ASCUS (FN). Of the 10 CIN III diagnoses: 9 (90.0%) were detected correctly as HSIL (TP) and 1 (10.0%) wrongly detected as ASCUS (FN). Of the 8 diagnoses of micro invasive squamous cell carcinoma: 6 (75.0%) participants were correctly detected as SCC (TP) and 2 (25%) participants detected wrongly as negative for intra epithelial lesion and as ASCUS (FN) Table **2**. Thus TN is 81, FP 5, TP 29, FN 15, Sensitivity 66.0%, Specificity 94.2%, PPV 85.3%, NPV 84.4%, FPR 14.7%, FNR 15.6% and Accuracy 84.6% Table **3**.

In the comparison of *VIA* and Pap smear in the detection of cervices negative for intraepithelial lesion; *VIA* had lesser specificity, it correctly detected (TN) 49 (57.6%) participants in comparison to Pap smear correct detection (TN), 81 (94.2%) participants. In the detection of cervices positive for intra epithelial lesion and malignancy, *VIA* had higher sensitivity, it correctly detected (TP) 41 (93.3%) participants in comparison to Pap smear correct detection (TP), 29 (66.0%) participants, Table **2**. *VIA* had lesser accuracy, it correctly identified 90 (69.0%) of the participants with or without cervical lesions in comparison to Pap smear correct identification of 110 (84.6%) participants. *VIA* positive predictive value (PPV) and negative predictive value (NPV) were 53.8% and 94.2% compared to Pap smear 85.3% and 84.4% respectively. *VIA* false positive rate (FPR) and false negative rate (FNR) were 46.1% and 5.8% compared to Pap smear 14.7% and 15.6% respectively. Significant difference in results validity of both test was assessed using WinPepi statistical programme; Pearson's Chi Square was use Table **3**.

Of the 44 participants with negative results for both *VIA* and Pap smear who were biopsied and histopathologically diagnosed, 41 participants were truely negative on diagnosis while 3 participants were diagnosed as CIN I. Of the 26 participants with positive *VIA* and Pap smear results, 25 participants were histopathologically diagnosed as positive, only one was diagnosed as negative, Table **2**. Thus combined *VIA* and Pap smear correctly detected 25 (96.2%) diseased participants (TP) and 41 (93.2%) non diseased participants (TN). The sensitivity (89.3%), specificity

Table 3: Comparison of Validity of *VIA*, Pap Smear and Combined *VIA* and Pap Smear Results

Measures	*VIA*	PAP Smear	P-Value b/w *VIA* and PAP Smear	*VIA* + PAP Smear
FP	37	5		1
FN	3	15		3
TP	41	29		25
TN	49	81		41
Sensitivity	93.3%	66.0%	0.003	89.3%
Specificity	57.6%	94.2%	0.000	97.6%
PPV	53.8%	85.3%	0.001	96.1%
NPV	94.2%	84.4%	0.08	93.2%
FPR	46.1%	14.7%		3.84%
FNR	5.8%	15.6%		6.82%
Accuracy	69.0%	84.6%	0.003	94.3%

Present of Significant Difference between *VIA* and Pap Smear Sensitivity, Specificity, PPV and Accuracy, however none with the NPV. Accuracy is higher when both screening methods are complimented.

Table 4: Proportion of Contraception Usage and Correlation to Positive *VIA* and Pap Smear

Contraception	Freq(n=40)/ Percent(13.3%)	*VIA* Positive (+ve)	Pap smear Positive (+ve)
Ocp	16 (5.3)	None	None
Postinor	6 (2.0)	None	None
Dmpa	5 (1.7)	None	None
Implanon	4 (1.3)	None	None
Iucd	5 (1.7)	None	None
Btl	4 (1.3)	None	None

Though contraception awareness was high, usage rate was very low. OCP and injectable contraception were used intermitently for short period.

(97.6%), PPV (96.1%), NPV (93.2%) and accuracy (94.3%) were improved comparably to *VIA* and Pap smear independently Table **3**.

Table **4** showed proportion of contraception usage and correlation to positive *via* and pap smear. Table **5** showed the positive *VIA* and Pap smear results in relation to age. The participants screened were asymptomatic women, however 31 (10.3%) presented with complaints. Commonest complaint was backache 26 (8.6%) with or without vaginal discharge and/or lower abdominal pain.

4. DISCUSSION

In this study to compare the reliability and validity of *VIA* to Pap smear in the detection of pre invasive cancer and cancer of the cervix using cervical biopsy specimen histopathologically diagnosed in women attending the Gynaecology, Family Planning, Postnatal, Staff and other Specialists clinics of ISTH, Irrua, Edo State, and among female staff of the hospital. This study showed a *VIA* positivity rate of 26.0% which doubled the Pap smear positivity rate of 11.4%. There was significant difference between the positivity rate of *VIA* and Pap smear; X^2 =21.25, P =0.000. These results were comparable with results of various studies with *VIA* positivity rate of 3 - 28% [1-4]. The wide variation in positivity rates in various studies is due to the different criteria used for screening as there are no standard criteria for a positive result, the different population of women screened and *VIA* is also provider dependent, the more experienced the evaluator, the lower the positivity rate.

This study confirmed more women with positive result with *VIA* than Pap smear resulting in increased cervical biopsied and higher sensitivity, compared to Pap smear with sensitivity of 66.0%, specificity 94.2%, PPV 85.3% and NPV 84.4%; *VIA* was more sensitive 93.3%, higher NPV 94.2%, less specific 57.6% and lesser PPV 53.8%. Since the same participants were screened with both methods, there was no selection bias. The results also confirmed previous earlier studies showing *VIA* is comparable to Pap smear in the detection of cervical cancer [1,2] with a higher sensitivity, but relatively lower specificity and high number of false positives [19,20,21]. The higher *VIA*

Table 5: Age Distribution of Positive *VIA* and PAP Smear

AGE n=300 (100%)	*VIA* +VE n=78 (100%)	PAP SMEAR +VE n=34 (100)	PAP SMEAR + VE n=34		
			LSIL n=14 (100)	HSIL n=14 (100)	SCC n=6 (100)
25 – 34 69 (23.0)	13 (16.7)	3 (8.8)	3 (21.4)	-	-
35 - 44 116 (38.7)	33 (42.3)	11 (32.4)	7 (50.0)	2 (14.3)	2 (33.3)
45 - 54 72 (24.0)	8 (10.2)	12 (35.3)	4 (28.6)	5 (35.7)	3 (50.0)
>54 43 (14.3)	24 (30.8)	8 (23.5)	-	7 (50.0)	1 (16.7)

Age group >54yrs had the least participants but had a relatively highest ratio of *VIA* +ve and HSIL, while the age group just below, 45 - 54 had the highest pap smear +ve and SCC result.

sensitivity is probably because all grades of aceto white and suspicious whitish lesions were taken as aceto white lesion by all six observers without uniform criteria. The sensitivity of the Pap smear has been found to be lower in developing countries; possible reason may be due to the large percentage of cervicitis which mask LSIL [1]. High rates of cervicitis in developing countries is related more to the poor and inadequate infection control. Pap smear sensitivity ranges between 50% and 80%, resulting in a high false negative rate of 9 - 40% [1,2,3]. The higher sensitivity and lower PPV of *VIA* compared to Pap smear does present the problem of many false positives with associated over treatment. However this has to be weighed against the cost benefits of induced patient anxiety while waiting for cytology result, patients lost to follow up and eventual presentation in late stage diseases with attendant high morbidity and mortality. *VIA* seemed to be particularly promising however, detecting all 21 (100%) participants with CIN II, CIN III and micro invasive cancer compared to Pap smear which detected 16 (76.2%) participants.

The *VIA* specificity of 57.6% was much lower than that of Pap smear of 94.2%, this is comparable with results of other studies with specificity ranging from 44% to 73% [19-22]. The wide variation in the results lies in the number of screeners, and in the lack of uniformity of the criteria used. The low specificity of *VIA* in this study could also be due to a large number of cervicitis detected by Pap smear in 60 (20.0%) participants, as it is well known that inflammatory cervical lesions become aceto white on acetic acid staining [25]. In areas with a high prevalence of cervicitis located far from high level health care facility, repeated *VIA* may be done after treatment with appropriate antibiotics, this will help improve specificity and avoid over treatment and excessive unnecessary burdensome referrals.

VIA had comparable higher NPV and much lower FN 3 (FNR 5.8%) *vs* lower NPV and higher FN 15 (FNR 15.6%) of Pap smear, which is within range of other studies. Due to the many steps involves in Pap smear test which includes collection, slide fixation, slide preparation, slide review and interpretation; this appear to contribute to the high false negative rate. Due to the very low FNR of *VIA*, when it is negative, the woman can go home, reassured that the likelihood of misdiagnosis and under diagnosis is very low and she is not likely to have a cervical lesion.

In this study, Pearson's Chi Square analysis of validity of both test results showed significant difference, there was significant difference in the sensitivity, specificity, PPV and accuracy, only for the NPV was there no significance difference. Therefore there is a difference between the validity of *VIA* and Pap smear in detection of pre cancerous and cancerous lesions of the cervix. It showed a significant relationship between the type of screening method used and the ability to accurately detect the presence or absence of a pre cancerous or cancerous lesion of the cervix. This suggests that the tests are not exactly an alternative to each other but depending on the targeted population, circumstances and the need for increased sensitivity or specificity, *VIA* or Pap smear will be appropriate and more accurate respectively. This study also suggests that much more accurate results will be gotten and more beneficial if both are used as complementary tests.

This study revealed the acceptability of *VIA* as a screening method by the participants, they were satisfied with their decision to be screened and the screening didn't take time, the counseling improved their awareness about screening methods and cervical cancer. They declared the screening experience was better than expected and they recommended that *VIA* should be performed on other women. Most participants that presented in the latter part of the study were informed and encouraged to present themselves for screening by earlier participants.

5. CONCLUSION AND RECOMMENDATIONS

Cervical cancer is a preventable cancer, this have been proven in developed countries with established effective cervical screening programmes in place, however in most developing countries like Nigeria, this remains a mirage due to non availability and high cost of required equipment for pap smear screening, dire of trained cytopathologists, cytotechnologists. Thus in low resource settings there is therefore the need for a cost effective, available and accurate screening method for regular interval screening to increase the possibility of detection. This study shows *VIA* to be a reasonable and effective alternative to Pap smear because it is cheap and cost effective, required resources locally obtainable, is simple, easy and rapid to administer and result is immediately visualised and immediately treated in a 'see and treat' protocol; thus reducing the problems of anxiety and loss to follow up before they are appropriately treated due to long waiting time for Pap smear results. It does not need much instructions and can be competently performed by low and middle level health care providers with prior training. The result

however suggests that *VIA* is not exactly a replacement for Pap smear if available and affordable, but both tests can preferably be used complementarily or adjunctively to get higher accurate results.

It is therefore recommended that *VIA* should be incorporated and integrated into national screening programme to complement cervical cytology and can be use alone as an effective method of choice to screen for cervical cancer in a 'see and treat' protocol in low resource communities in developing countries like Nigeria where access to Pap smear is limited or lacking. This will help reduce the cervical cancer burden in developing countries. There is also the need for increased community awareness of cervical cancer and screening. There is the need for political will to integrate cervical cancer screening programs into all levels of health care services, maximising the benefit of *VIA* in developing countries. There is still the need for research for alternate screening tests and/or improvement of existing tests, for a single test or combined tests with a very high sensitivity and specificity, with a relative low cost and local availability that can be used easily in resource poor settings.

LIMITATIONS

This is a hospital based study with a small sample size, results would be more representative and epidemiologically significant if the study is multi-centered and sample size much larger. *VIA* results may not be uniform, as there is a high possibility of intra and inter observer errors among the six evaluators, as there was no standardised criteria for a positive result, thus *VIA* can be provider dependent, the more experienced the evaluator was, the lower the positive results. There is also a high possibility of intra and inter observers' errors in Pap smear slide preparation and slide interpretation, which may contribute to the high false negative rate. All participants with negative *VIA* and Pap smear results, did not have cervical biopsy due to cost and financial limitation, and most with negative Pap smear result could not be justified to be recalled back for cervical biopsy.

CONTRIBUTING AND COMPETING INTERESTS

NIL

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