Benha Journal of Applied Sciences (BJAS) **print: ISSN 2356–9751**
Vol. (8) Issue (7) (2023), (15-26) **online: ISSN 2356–976x**
http://bjas.journals.ekb.eg

Comparison of the Accuracy of Visual Inspection with Acetic Acid, Visual Inspection with Lugol Iodine and coloscope in Screening for Cervical Neoplasia

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Abstract

Background: Cervix cancer is a main cause of illness and death globally among women. It is the second most prevalent cancer and the leading cause of cancer-related death in women. To combat the condition, it is necessary to create a screening test with high specificity and sensitivity. **Aim of the Work:** to compare Visual Inspection with Acetic Acid, Visual Inspection with Lugol Iodine and colposcope Accuracy in Cervical Neoplasia Screening. **Patients and Methods:** This study is a Cross-sectional study this study was conducted in Obstetrics and Gynecology department at Benha University hospitals. The study period was carried out from February 2022 to January 2023. **Results:** In the current study, the mean age was 38.93±7.2 years and the most common age category was 40-50 years in 25 (38.5%) patients. In the present study, most of the studied cases 58 (89.2%) were House wife, only 4(6.2%) cases were nurse and 3 (4.6%) were Teacher. As regard to contraception, the most common Contraception used was IUCD in 34 (52.3%), then 8 (12.3%) cases used Cocs, 4(6.2%) cases used Pops and also tubal ligation, 3 (4.6%) cases used DMPA. As regard to symptoms, there were 37 (56.9%) suffer from bleeding, 47 (72.3%) cases had positive Discharge, 43 (66.2%) cases had pain. In the present study, there were 19(29.2%) cases had abnormal VIA and 46 (70.8%) cases were normal, there were 19(29.2%) cases had abnormal VILI and 46 (70.8%) cases were normal and there were 34(52.3%) cases had abnormal Colposcope and 31 (47.7%) cases were normal. By biopsy there were 32(49.2%) cases had abnormal Biopsy and 33 (50.8%) cases were normal **Conclusion:** The saying "preventable but not prevented" still applies to cervical cancer because there are currently no screening methods that are 100% sensitive and have good specificity**.** As a result, in the current study, an effort has been made to assess the colposcopy, VILI and VIA both separately and compined.

Keywords: Visual Inspection, Acetic Acid, Lugol Iodine, coloscope, Cervical Neoplasia**.**

1. Introduction

Cervical cancer is the second most prevalent malignancy in women globally. In underdeveloped regions of the world, 86 percent of cervical cancer diagnoses and 88 percent of cervical cancer-related deaths occur **(1).**

Human papilloma virus, a common sexually transmitted infection, is the primary underlying cause of cervical cancer. Several sexual partners, sexual activity onset at early age, increasing parity, hormonal contraceptives usage for 5 years or longer, current or previous sexually transmitted infection and smoking are the risk factors for cervical cancer **(2).**

Cervical cancer has a very long precancerous period, which provides a considerable window of opportunity to detect and treat it completely. If regular screening is made a part of the routine check-up for all women, the onset of cancer can be detected at an early stage and combated effectively **(3).**

Long natural history of development makes cervical cancer amenable to screening. Present opportunistic approach to cervical cancer screening cannot reach sub-populations of women living in low-resource, medically underserved regions, and thus invasive cervical cancer is a disease strongly related to socioeconomic, geographic, and racial disparities **(4).**

Screening with conventional cytology has significantly decreased squamous cell cancer mortality, mostly owing to a rise in the diagnosis of early-stage invasive cancer and pre-invasive lesions treatment, hence decreasing the invasive cancer total incidence **(5).**

Studies have demonstrated that alternative screening procedures include VIA and VILI. They are cheap and noninvasive and can be done in a low-level health facility **(6).**

More importantly, VIA and VILI give quick findings, and individuals whose precancerous lesions qualify for therapy may be treated promptly. This see-and-treat technique improves early adherence to therapy, hence reducing the issue of missed appointments and referrals **(7).**

2.Patients And Methods

Type of the study: Cross-sectional study.

Study setting: this study was carried out in Obstetrics and Gynecology department at Benha University hospitals.

Study period: the study period was carried out from february2022 to January 2023.

Study population: All Women who are attending to the outpatient gynecological clinic of Benha university hospital and fullfiling the inclusion criteria, were included after approval of participation.

Inclusion criteria: age between 21 and 65 years, both nulliparous and multiparous, women complaining of recurrent vaginal discharge, contact bleeding and chronic pelvic pain with clinical evidence of suspicious cervix (Ectropion, Nabothian cyst, cervical polyp, leukoplakia and Obstetric or surgical trauma) and patient referred to early detection cancer unit at Benha University Hospital.

Exclusion criteria: women who are already diagnosed of cervical malignancy, history of previous cervical cancer imaging abnormal outcomes, pregnant women, postpartum within 6 weeks and women who are not consenting to participate.

Ethical consideration: approval of the study protocol by an Ethical Scientific Committee of Benha University was obtained, an Informed written consent was obtained from the patient and finally an administrative permission was taken.

All patients were subjected to: **Personal history:** Name – age – parity – occupation – special habits of medical importance) and Family history. **Menstrual history: Last menstrual period, Rhythme, amount of flow.**

Present history: related symptoms: (abdominal pain and bleeding) and discharge per vaginum, infertility, prolapse, pain abdomen, urinary complains

Obstetric history: for each previous pregnancy.

Surgical history: any cervical surgeries and previous cesarean section

General Examination: vital signs (Blood pressure, pulse, temperature, respiratory rate; body mass index (BMI). and blood pressure), chest & heart and limbs ealuation.

Abdominal examination: for liver, spleen & loin

Procedure of the study

↓

65 cases

↓

VIA

↓

VILI

↓

Colposcope

↓

± BIPOSY

Practical steps of the study:

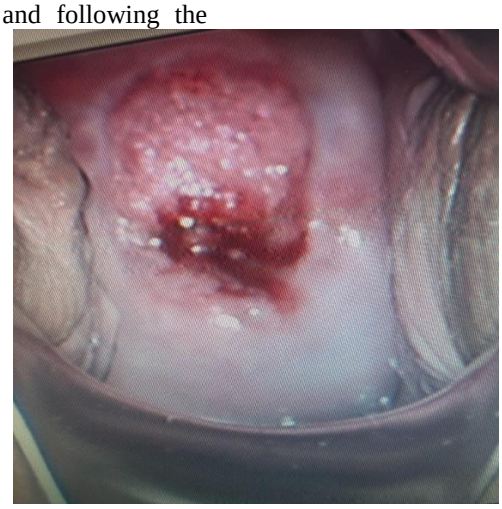
I- Visual Inspection with Acetic Acid (VIA): Principle of VIA test: Application of acetic acid to cervical epithelium induces reversible intracellular dehydration and protein coagulation inside cervical cells. Coagulation intensity is proportional to protein present in the cell quantity. As dysplastic cells contain more chromatin, the coagulation is severe and the cells become white when acetic acid is applied.

Procedure of VIA test: All the women were educated about cervical cancer, the screening processes, and the aims of the research; then, after obtaining their agreement to participate in the trial, they were given a thorough screening explanation. The woman was reassured that the operation is painless, and every effort was made to make sure that she is fully comfortable and at ease during testing; informed consent was gained prior screening; the woman was asked to lie in a modified lithotomy position; the speculum was gently introduced and opened to view the cervix in a good light source; and the external os, columnar epithelium (red in colour), and cervix were identified.

Determine the transition zone. In the transformation zone closest to the squamocolumnar connection, neoplastic changes take place. Utilizing a cotton swab saturated in acetic acid, add 5% acetic acid with care. The fluids should be cleaned away carefully. Following usage, the cotton swabs should be discarded in the trash bucket. Upon swab removal, carefully examine the cervix for white lesions, especially in the transformation zone near squamocolumnar interface, or dense, nonremovable acetowhite regions in the columnar epithelium. 5 percent acetic acid application to the cervix leads to epithelial tissue swelling and reversible coagulation or cellular proteins precipitation.

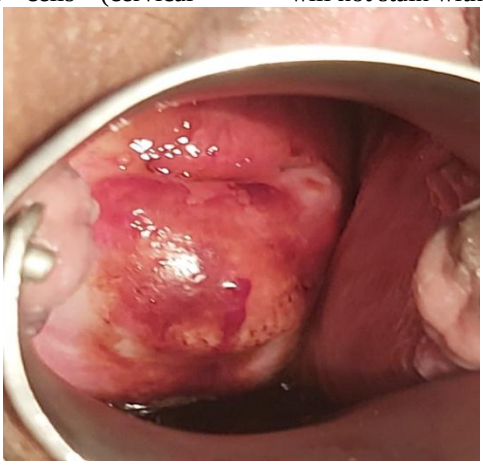
VIA result: For the purposes of this research, VIA is positive if there is cervical epithelium acetowhitening after 5% acetic acid application, and it is negative if there is no acetowhitening; the findings of the VIA test should be recorded one minute following the test is performed. (Reporting before one

minute may overlook late-appearing lesions). Note the rate of appearance and disappearance of the acetowhite lesion, and following the process, write the interpreted findings in the prescribed manner.



II- Visual Inspection with Lugol Iodine (VILI): Principle of VILI test: The epithelium of squamous cells includes glycogen. Since iodine is glycophyllic, it becomes mahogany dark or black whenever adhered to normal squamous epithelium. However, columnar epithelium and juvenile metaplastic cells do not possess glycogen and are thus not stained by LugoTs iodine. Depending on the lesion severity, the inflammatory cells either partly stain or do not stain, while the aberrant cells (cervical intraepithelial neoplastic cells) have either less glycogen or none at all. Therefore, following iodine addition, these lesions color changes from brown to mustard yellow.

Procedure of VILI test: Apply LugoTs iodine to the cervix by a swab stick shortly after evaluating the VIA test result following the VIA process. In contrast to the VLA test, VILI test findings may be instantly evaluated. If a VIA-positive lesion is present, the aberrant region will be mustard yellow and will not stain with iodine.



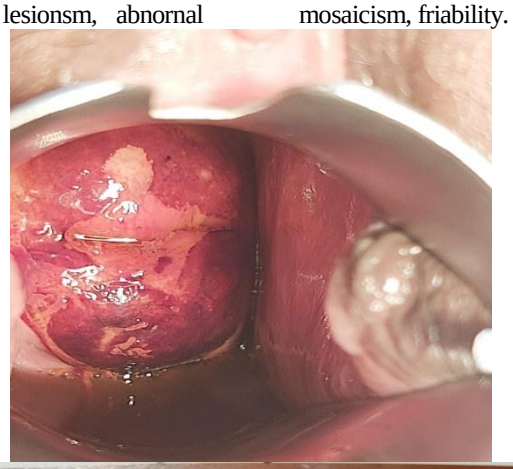
III- Colposcopy: Indication: further assessment of abnormal cervical cytologic or HPV testing and evaluation if a visually abnormal cervix, vagina or vulva. **Procedure:** colposcopy takes 5 to10 minutes. Similar to a pelvic exam or Pap test, a metal speculum was inserted into the vagina while the ladies reclined on a table with their feet supported. The speculum holds the vagina open so the doctor can see the cervix, the colposcope is placed a few inches away from the vulva, a bright light is shone into the vagina and the doctor looks by the colposcope Lense, as if utilizing binoculars, the vagina and cervix are swabbed to remove any mucus, and vinegar or another solution is added to the region. This may result in a tingling or burning feeling. The solution assists in highlighting questionable cell regions.

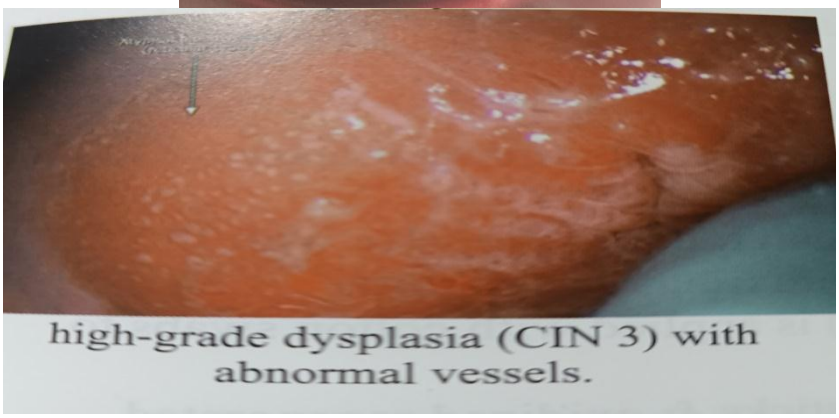
Preparation for the colposcopy: the women were told to avoid scheduling the colposcopy during the period, The women were instructed not to have vaginal relations or to use tampons and vaginal medications a day or two before the colposcopy, and to take an over-the-counter painkiller such as ibuprofen before their colposcopy appointment and tell the women to Cop with anxiety before the colposcopy

Colposcopy results: Colposcopy will usually be able to tell away if there are abnormal cells in the cervix. About 4 out of 10 women who have a colposcopy have anormal

result and depending on the age, the women were invited for a cervical screening appointment in 3 or 5 years.

Colposcopic finding include: Aceto white lesions with sharp borders suggest high-grade lesions, aceto white lesions with diffuse borders suggest low-grade lesionsm, abnornal vascular patterns: mosaicism in a field of acetowhite epithelium suggest CIN, punctation in a field of aceto white epithelium suggest CIN and atypical vessels suggest micro invasive or invasive disease. The inflammatory changes can appear similar to high grade lesions, with diffuse mosaicism, friability.





high-grade dysplasia (CIN 3) with abnormal vessels.

IV- Biopsy: All subjects had a cervical punch biopsy at the 6 and 12 o'clock locations using Tischler biopsy forceps. In addition, lesion punch biopsies were done on all subjects with suspected lesions on VIA or VILI, regardless of their location in the cervix, with the biopsy specimens histology serving as the gold standard in this research. The staff at Benha university of oncological unit did the Papanicolaou test, VIA, VILI, and cervical punch biopsies. The histology findings were reported as normal; inflammation; cervical intraepithelial neoplasia 1, 2, or 3; or cervical cancer, if there are multiple suspicious areas, multiple biopsy samples were taken and biopsy results usually take about 4 weeks.

Statistical Methods: SPSS (Statistical Package for the Social Sciences) version 26 for Windows® was used to encode, process, and analyse the obtained data (IBM SPSS Inc, Chicago, IL, USA). The quantitative results were represented as mean ± SD (Standard deviation).

Receiver operating characteristic (ROC) analysis: It is a graphical representation of the sensitivity versus one minus the specificity (false positive rate) for various cutoffs. Using **the Youden index J**, which is the point on the ROC curve furthest from the diagonal line of equality [maximum (sensitivity + specificity) - 1], the ideal cutoff value was calculated. Total area under ROC curve (AUC or AUROC) is a measure of the overall accuracy of a test. The greater the AUC, the more accurately a test can identify between sick and non-diseased people. The ROC curve was used to assess the test features, which comprised the optimal cutoff value, AUC, its standard error (SE), and P-value. In addition, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were determined at the best threshold to evaluate the test efficacy.

3. Results

Table (1) Correlation of VIAand VILI with Colposcope, examination

	Normal	Abnormal	Low grade	High grade
VIA	46(70.6%)	19(29.2%)	11(16.9%)	8(12.3%)
VILI	46(70.6%)	19 (29.2%)	11(16.9%)	8(12.3%)
Colposcope	31(47.7%)	34 (52.3%)	24(36.9%)	8(12.3%)

VIA and VILI include 19 cases abnormal divided into 11 cases low grade lesion that include (4 cases squamous metaplasia, a case of squamous interepithelial lesion low grade and 6 cases CINI), 8 cases high grade lesion include (2 cases squamous interepithelial lesion high grade, 3 cases CINI II, 2 cases CIN III, one case cervical cancer).

Colposcope include 34 cases abnormal divided in to 24 cases low grade include (2 cases inflammatory, 8 cases squamous metaplasia, 5 cases SIL-low grade, 2 cases focal atypia, 9 cases CINI) and 8 cases high grade lesion include (2 cases SIL high grade, 3 cases CIN II, 2 cases CIN III, one case cervical cancer

Table (2) Correlation of Colposcope, with Biopsy examination

Colposcope	**Biopsy**		**Total**
	abnormal	**Normal**	
abnormal	32(49.2%)	2(3%)	34(52.3%)
Normal	0	31 (47.7%)	31 (47.7%)
Total	32(49.2%)	33 (50.8%)	65(100%)

Table 2 showed that from a total 65 cases Colposcope performed there were 34(52.3%) were abnormal of these 34 cases ; 32(49.2%) cases were abnormal in biopsy and 2(3%) were normal

Table (3) Correlation of VIA and VILI with Biopsy examination

VIA and VILI	**Biopsy abnormal**	**Normal**	**Total**
abnormal	19(29.2%)	0	19(29.2%)
Normal	13(20%)	33 (50.8%)	46 (70.8%)
Total	32(49.2%)	33 (50.8%)	65(100%)

Table 3 showed that from a total 65 cases VIA and VILI performed there were 19(29.2%) were abnormal and all of them were abnormal in biopsy and 46(70.8%) were normal in VIA and VILI but only 33 (50.8%) of them were normal by Biopsy.

Table (4) Tests characteristic of screening tests in detecting Cervical Neoplasia

	Sens.	**Spic.**	**accuracy**	**AUC**
VIA and VILI	61,29	80,00	**80.0**	**0.652**

AUC: area under the curve

Table 4 showed that, the Sensitivity of VIA and VILI in detecting Cervical Neoplasia was 61,29%, the specificity was 80% and the accuracy was 80%.

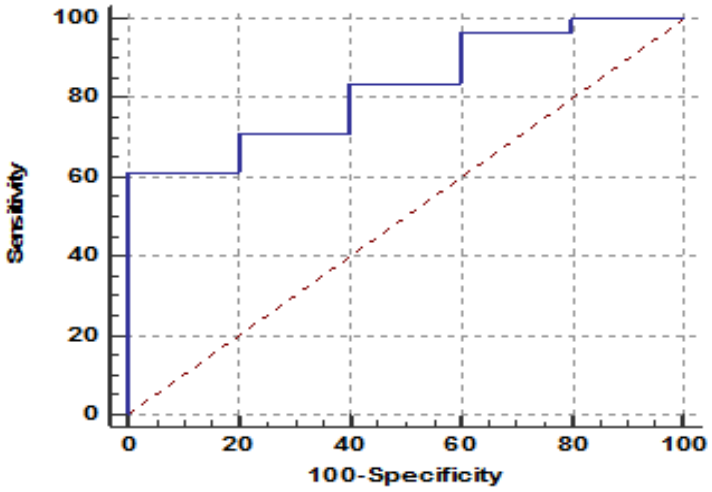


Fig. (1) Receiver operating characteristic (ROC) curve of VIA and VILI in the studied group.

Table (5) Tests characteristic of screening tests in detecting Cervical Neoplasia

	Sens.	**Spic.**	**accuracy**	**AUC**
Colposcope	82,86	90,54	**96.92**	**0.940**

Table 5 showed that, the Sensitivity of Colposcope in detecting Cervical Neoplasia was 82,86%, the specificity was 90,54% and the accuracy was 96.92%.

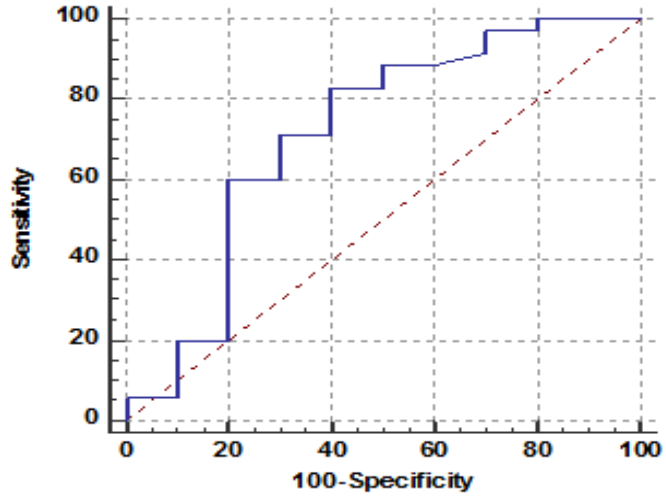


Fig. (2) Receiver operating characteristic (ROC) curve of Colposcope in the studied group.

Table (6) Tests characteristic of screening tests in detecting Cervical Neoplasia

	Sens.	**Spic.**	**accuracy**	**AUC**
Colposcope, VIA and VILI	66,67	80,35	**76.92**	**0.570**

AUC: area under the curve

Table 6 showed that, the Sensitivity of Colposcope, VIA and VILI in detecting Cervical Neoplasia was 66,67%, the specificity was 80,35% and the accuracy was 76.92%.

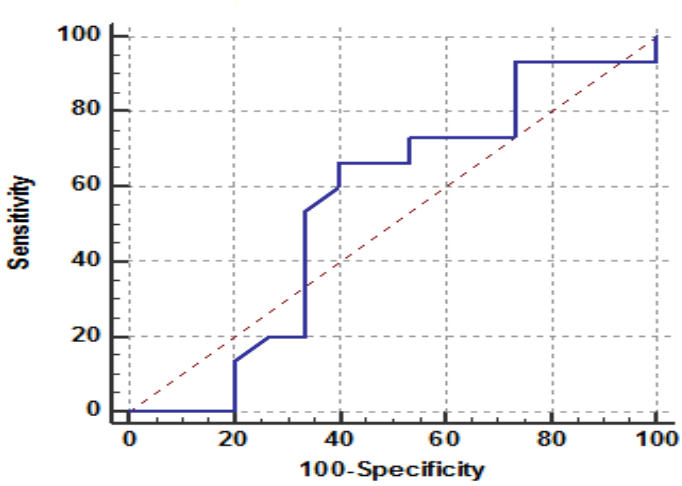


Fig. (3) Receiver operating characteristic (ROC) curve of Colposcope, VIA and VILI in the studied group.

Table (7) Tests characteristic of screening tests in detecting Cervical Neoplasia by colposcopy

Colposcopy	Low grade	High grade	Total
Sens.	83,12	89,03	88.2%
Spic.	59.95	61.36	60.6%

AUC: area under the curve

Table 7 showed that, the Sensitivity of colposcopy in detecting Cervical Neoplasia of high grade was 89,03%, and of low grade was 83,12, the specificity of high grade was 61.36% and of low grade was 59.95%.

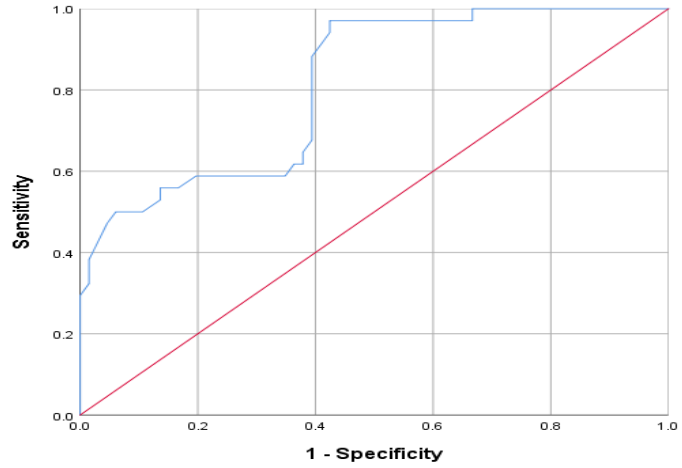


Fig.(4) Receiver operating characteristic (ROC) curve of Cervical Neoplasia by colposcopy

Table (8) Tests characteristic of screening tests in detecting Cervical Neoplasia by VIA and VILI

VIA and VILI	Low grade	High grade	Total
Sens.	73,26	79,16	75%
Spic.	61.36	71.13	69.1%

AUC: area under the curve

Table 8 showed that, the Sensitivity of VIA and VILI in detecting Cervical Neoplasia of high grade was 79,16%, and of low grade was 73,26, the specificity of high grade was 71.13% and of low grade was 61.36%.

4. Discussion

According to WHO, Cervical cancer is the second most prevalent form of cancer among women, and was responsible for over 250,000 deaths in 2005. Approximately 80% of these deaths occurred in developing countries. Without urgent intervention, deaths from cervical cancer are expected to increase by about 25 percent over the next decade **(Consul et al., 2012)**.

Human Papillomavirus (HPV), the most prevalent viral infection of the female reproductive system, is primarily responsible for cervical cancer. Nearly all sexually active people will be infected with HPV at some point in their life, and some may be infected many times **(9)**.

Cervical cancer is avoidable if precancerous lesions are found early via good screening programs, but establishing and implementing such programs in low-income countries is tough. For cervical screening to be effective in resource-limited settings, the screening test, diagnosis, and treatment must be available to the bulk of at-risk women either on-site or at nearby clinics **(10).**

Faced with these obstacles, visual inspection tests employment such as VIA and VILI, which need little equipment and are less expensive than other methods, seems to be a feasible option for low-income nations **(11)**.

The aim of work of the current study was to compare the Accuracy of Visual Inspection with Acetic Acid, Visual Inspection with Lugol Iodine and colposcope in Screening for Cervical Neoplasia.

To elucidate this aim 65 women who are attending to the outpatient gynecological clinic of Benha university hospital were included in the study.

In the current study, the mean age was 38.93±7.2 years which near to the results in **(10)** study, who found that participants mean age was 42.7 years (range: 30–85 years). Also, in another study by **(12)** the mean age of their studied cases was35.1 ± 9.8 years. Kumar and colleagues hypothesized that a woman may acquire cervical dysplasia at any age, but often between the ages of 25 and 40 **(13).**

In this study, the most common age category was 40-50 years in 25 (38.5%) patients followed by 30-40 years in 19 (29.3%) patients while in the study done by **(14)** the most common age group was 64% belonging to the age group of 30-39 years. In another study by **(15)** Almost 70% of the patients were between the ages of 30 and 49.

This result was parallel to **(16)** who studied "Systematic screening for cervical cancer in Dakar region: prevalence and correlation with biological and sociodemographic parameters" reported that age group with the greatest number of participants was 40 to 49 years old, with a mean age of 41 ± 11.16 years; more than a third had a secondary education and more than half were housewives.

In our study, the most common obstetric history was P3 in15 (23.1%), P4 in 10 (1.8%) patients, then P2 in 7(10.7%) followed by P3+1 in 5 (7.7%). Parity is also a risk factor for cervical cancer. A parity of five or more is seen as a cervical cancer risk factor **(11)**.

In the current study, most of the studied cases 58 (89.2%) were House wife, only 4(6.2%) cases were nurse and 3 (4.6%) were Teacher which coincide with the results in the study done by **(17)** who found that 75.3% of their studied cases were house wives and 24.7% were workers. Also, in another study by **(18)** at the time of the study, The bulk of participants were housewives or household helpers (n=223, 62.6%), while the remainder were farmers (n=62, 17.42% of the sample) or private workers (n=36, 10.11%).

As regard to contraception, the most common Contraception used was IUCD in 34 (52.3%), then 8 (12.3%) cases used Cocs, 4(6.2%) cases used Pops and also tubal ligation, 3 (4.6%) cases used DMPA, while in the study done by **(19)** there were 1029 (53.4%) had not use any type of contraception and 443 (23.0%) of them used pills, 182 (9.5%) used DMPA. They stated that approximately 20% of individuals used some kind of contemporary contraception; thus, including VIA screening into family planning visits may be a means to promote preventative programs. Kenya reached a like result by **Were et al. (2010)**, When 14% of women seeking contraception tested positive for HIV and urgent cryotherapy was likely possible.

In this study, there were 37 (56.9%) suffer from bleeding, 47 (72.3%) cases had positive Discharge, 43 (66.2%) cases had pain and, in the study, done by **(12)** The most common symptoms were vaginal discharge (61%), genital itching (27.7%), back discomfort (33%), lower abdomen pain 14%, pain during sexual activity (2.4%), atypical vaginal bleeding (2%) and after coital bleeding (1.3%)

In the present study, there were 19(29.2%) cases had abnormal VIA and 46 (70.8%) cases were normal which near to the results in the study done by **(11)** found that VIA, were positive in 45 cases (14.65%).

(8) also found that VIA was positive in 29 individuals (13.81%) whereas it was normal in the rest 181 patients (86.19%). **(19)** found that 134 (7.0%) females were positive. This is comparable to the percentages reported by **(20)** (6.8 %) and Colombia (7.4%) (21), but lower than the rates discovered in Mongolia (12.6%) **(22)**, Kenya (13.2%) **(23),** Ghana (13.2%) **(24)**, and Thailand (13.3%) **(25).**

Without histology, it cannot be known if this indicates a variation in the prevalence of CIN or is linked to the conduct of the test. Infidelity among men, having simultaneous sexual partners, the prevalence of sexually

transmitted illnesses, the prevalence of HIV, and the usage of condoms are examples of social sexual behaviors that may impact VIA positive but were not investigated in this research. These considerations assist determine the best screening age and interval **(19).**

Also, in the study done by **(15)** 88 VIA and VILI positive tests (38 percent) closely matched our findings. This number is much higher than the 13 percent positive tests reported by **(26)** using VIA alone. This may be related to the fact that they worked with a bigger sample (954 women were examined) than we did (65 women).

Regarding to VILI, there were 19(29.2%) cases had abnormal VILI and 46 (70.8%) cases were normal. In the study done by **(10)** VIA was positive for 555 (36.3 percent) while VILI was positive for 401. (26.2 percent). Also, in another study by **(11)** It was positive in 44 (14.33%) cases.

In the current study, from a total 65 cases Colposcope performed there were 34(52.3%) were abnormal of these 34 cases; 32(49.2%) cases were abnormal in biopsy and 2(3%) were normal.

In the present study, from a total 65 cases VIA and VILI performed there were 19(29.2%) were abnormal and all of them were abnormal in biopsy and 46(70.8%) were normal in VIA and VILI but only 33 (50.8%) of them were normal by Biopsy also in the study done by **(12)** following colposcopy and biopsy, 21/23 were positive for VIA, whereas 2/23 were negative. 8/12 were positive for VILI and 4/12 were negative.

In our study, VIA and VILI sensitivity in detecting Cervical Neoplasia was 61,29%, the specificity was 80% and the accuracy was 80%. The Sensitivity of Colposcope in detecting Cervical Neoplasia was 82,86%, the specificity was 90,54% and the accuracy was 96.92%which coincide with the results in the study done by **(11)** who found the Sensitivity of VIA= 94.87%, specificity of VIA= 97.01%, Sensitivity of VILI= 92.30%, specificity of VILI= 97.01%

Also, in the study done by **(12)** The sensitivity and specificity of VIA and VILI were 91.30 percent and 66.54 percent, respectively, whereas the sensitivity and specificity of colposcopy were 86.23 percent and 95.90 percent, respectively.

(27) evaluated the sensitivity of the VIA technique for cervical cancer screening in Iran and found it to be 74.3 percent. The specificity of the VIA was 94%.

(28) carried out four distinct screening procedures: visual examination with acetic acid, magnified visualization with acetic acid (VIAM), spatula + cotton swab PAP smear, and cervical brush PAP smear. The test sensitivity was shown to be 37% for VIA and 34.1% for VIAM. The rates of specificity were 90.7% and 90.7%, respectively. The sensitivity of VIA was the greatest among the four recommended tests for first cervical cancer screening in the Philippines.

In the study done by **(14)** VIA sensitivity and specificity were 87.5% and 63%, the Sensitivity of VILI was 87.5% and the specificity was 58.7%.

(8) found that Sensitivity of VIA=84.20%, specificity of VIA=55.20%, Sensitivity of VILI=89.50%, specificity of VILI=75.90%.

In the IARC multicenter research conducted in India and Africa by **(2004)**, which comprised 11 cross-sectional investigations, the sensitivity of VIA varied from 56.10 to 93.90 percent, and its specificity ranged from 74.20 to 93.80 percent.

In the IARC multicenter research conducted in India and Africa by **(29)**, which consisted of 11 cross-sectional investigations, the sensitivity of VILI varies from 76.00% to 97.00%, while the specificity extends from 73.000% to 91.30%.

In the study done by **(10)** the VIA sensitivity was 87.5% and the specificity was 63%, in another investigation, sensitivity (88.9 percent) and specificity were shown to be greater (69.8 percent)

Variability in VIA positivity between studies may be due to a number of factors, including the skill and experience of the health care provider performing the test, variation in the light source, procedure for preparation of 4–5% acetic acid solution and its storage, underlying prevalence of sexually transmitted diseases or cervical disease, and the choice of gold standard or non-uniformity of the gold standard for disease definition **(30,31).**

Even in this scenario, the findings are consistent with previous research demonstrating that a visual examination of the cervix following application of acetic acid is linked with a high sensitivity but a poor specificity and positive predictive values for high grades of CIN and invasive cancer **(14)**.

In this study, the Sensitivity of Colposcope, VIA and VILI in detecting Cervical Neoplasia was 66,67%, the specificity was 80,35% and the accuracy was **76.92**% which near to the results in the study done by **(8)** who found that Sensitivity of combination tests =94.70%, specificity of combination tests= 48.30%

Our outcomes are parallel to **(32)** study, **(33)** and **(34)** studies, Research shown that VIA and VILI combination with Pap smear

significantly increased their performance as screening tests at the expense of a high percentage of women being referred for further treatment due to false-positive findings and lower specificity.

(29) found a similar outcome and suggested using both VIA and VILI concurrently to boost test sensitivity.

In a meta-analysis of 62 investigations performed between 1984 and 1992 by **(35)**, the mean sensitivity and specificity of cytology were 58 percent (range 11–99 percent) and 68 percent (range 14–97 percent), respectively.

In a recent meta-analysis conducted by **(36)**, the sensitivity of cytology to identify CIN 2 or worse lesions varied from 18 to 98 percent, while its specificity ranged from 17 to 99 percent.

Most studies compared VIA and VILI to the gold standard of colposcopy with biopsy. According to the findings of Rana et al., VIA can detect the majority of instances of pre-cancer and cervical cancer. They discovered that VIA had a superior negative predictive value but a poorer specificity. Therefore, when the test result is negative, the lady may rest comfortable that she does not likely have a cervical neoplasm **(12)**.

In the study by **Samira et al.**, the sensitivity and specificity for cytology were 52.6% and 72.1%, respectively, compared to Cronje's 2001 study, which had a sensitivity of 19.3% and a specificity of 99.3%. In research conducted by **(37)**, the figures were 44.3% and 90.6%, respectively.

In our study the results revealed that VIA, VILA, Colposcope has the same sensitivity and specifity in determining high grade cervical lesions, but on the other side, colposcope detect more cases of low-grade cervical lesions than VIA and VILA with P-value more than 0.5%.

5. Conclusion

The saying “preventable but not prevented" still applies to cervical cancer because there are currently no screening methods that are 100% sensitive and have good specificity**.** As a result, in the current study, an effort has been made to assess the colposcopy, VIA, and VILI both separately and combined. The combination tests had high sensitivity and high specificity with high accuracy. Not only might VIA and VILI be utilized for screening in settings with limited resources, but also in well-equipped facilities. To lower the cost to the patient and the health care system, however, thorough training and recurrent reinforcement sessions are required due to the large frequency of false positive outcomes.

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