Accuracy of visual inspection with acetic acid in cervical ectopy evaluation

Doaa M. Sheesha, Suzan E. Mansour, Nahed F. Kheder, Mohammad A. Emam

1 Department of woman’s health and midwifery nursing, Faculty of nursing, Mansoura University, Mansoura, Egypt
2 Department of obstetrics & gynecology, Faculty of Medicine, Mansoura University, Mansoura, Egypt

ABSTRACT

Background: Cervical erosion is one of the most common pathological conditions encountered in outpatient gynecological clinics in middle-aged women. A simple method for diagnosis and treatment can play a tremendous role to comfort these women.

Methods: The study includes fifty female patients attended the outpatient clinic of obstetrics & gynecology department in Mansoura University hospitals. All patients selected according to inclusion and exclusion criteria. The study was undertaken during the period from June 2014 to December 2014. Tools: Two tools were used for data collection: (1) Interviewing questionnaire schedule divided into three parts which were used to assess general characteristics of women, obstetric and gynecological history and the presence of cervical ectopy symptoms. (2) Local cervical assessment by vinegar acetic acid (VIA) test.

Results: The study results revealed that 30 subjects (60%) were VIA positive and 20 subjects (40%) were VIA negative. VIA sensitivity was 100%, specificity 45%, PPV 71% and NPV 75%. There was a statistically significant relation between duration of marriage, high parity, IUDs use and VIA positivity.

Conclusions: Using VIA test was an accurate and effective method for detection of cervical ectopy. VIA test should be performed in all the women attending outpatient gynecological clinics even in the presence of Pap smear facility to improve detection rate of cervical lesions and provide better patient counseling and treatment.

Key Words: Cervical erosion, Visual inspection of cervix using Acetic Acid, Transformation zone, Squamocolumnar junction

1. INTRODUCTION

Uterine cervical ectopy is the occurrence of a single-layered secreting columnar epithelium (which usually covers the cervical canal, i.e., the endocervix), beyond the external cervical orifice. Thus, the multilayered squamous epithelium typically found in the vagina and exocervix are replaced. This condition has many names in medical terminology: ectropion, erythroplakia, macula rubra and erosion.[1]

Cervical ectopy is a condition where the ectocervix contains columnar cells. Squamous cells which cover the cervix are multiple layers thick. However, columnar cells are only one layer thick, meaning that the blood vessels underneath columnar cells are closer to the surface. Studies suggest that women with ectopy more often get sexually transmitted infections and HIV because the blood vessels are closer to the surface.[2,3]

The prevalence reported for ectopy ranges from 17% to 50% given that its course is usually time-limited, the prevalence estimates in a population will detect only the women with ectopy at that time. In such populations, some women will
already have had this condition and others will develop it. It is likely that most women, if not all, will have ectopy at some point during their lifetimes.\cite{1}

There are many factors associated with cervical ectopy conditions such as: the use of oral contraceptive pills (OCPs) and intra-uterine contraceptive devices (IUCDs) has been implicated as a cause of cervical ectopy. A prevalence study in China among female users of family planning services reported that 43.2\% of women had cervical ectopy.\cite{4} Another study on women using OCPs and IUCDs in Benghazi, Libya also observed that cervical ectopy was the commonest gynecological disorder among the women (54.9\%).\cite{5}

Ectopy is rare beyond the menopause and frequent at reproductive ages. It has a higher prevalence during pregnancy and also among users of estrogen-based contraceptives. The rare examinations on newborns that have been reported show high prevalence, probably secondary to estrogens of pregnancy. There is also, starting in puberty, a negative association with age, even before the menopause. Some studies demonstrated a negative association with the number of years of sexual activity and number of partners.\cite{1}

Cervical ectopy and the associated squamous metaplasia are now considered to be physiological phenomena. However, its management has historically consisted of interventions with the purpose of inducing or accelerating its regression. There seems to be a current trend towards less intervention, but it is still very common. The treatments currently available are electrocoagulation, cryocauterization, laser cauterization and drug treatment. Cauterization, in its several variants, is the treatment most often used and its efficacy is around 90\%\cite{1}

Diagnosis of cervical ectopy with VIA test: conventional cytology or the (PAP) smear is the first method for detection of cervical abnormalities. However, it has many limitations e.g., lack of trained technicians, lack of follow up of the results. WHO recommended visual inspection with acetic acid as an alternative to Pap smear in poor resource settings.\cite{6}

Visual inspection by acetic acid is defined as a visual inspection method involving a 3\%-5\% acetic acid wash of the cervix followed a minute later by a naked-eye assessment of the cervix. It was first reported by Ottaviano & La Torre in 1982.\cite{7}

1.1 Significance of the study
Cervical ectopy is the leading cause of cervical cancer. In low-resource settings, cytology programs are limited by lack of infrastructure. Many developing countries are therefore seeking alternative screening methods. Visual inspection with acetic acid (VIA) is gaining popularity for cervical ectopy screening in developing countries. It involves application of 5\% acetic acid to the cervix and examination with the naked eye. If aceto-white lesions are observed, the result of the examination is positive. Positive lesions are often treated immediately.\cite{8}

1.2 Aim of the study
The aim of this study was to evaluate the accuracy of visual inspection with acetic acid for cervical ectopy evaluation.

1.3 Research question
What is the effectiveness of vinegar acetic acid (VIA test) on evaluation of cervical ectopy?

1.4 Operational definitions
Cervical ectopy: The occurrence of single-layered secreting columnar epithelium beyond the external cervical orifice.

Negative predictive value (NPV): The proportion of patients with negative tests who do not have disease.

Positive predictive value (PPV): The proportion of patients with positive tests who have disease.

Sensitivity: The proportion of patients with disease who test positive.

Specificity: The proportion of patients without disease who test negative.

2. METHODOLOGY
2.1 Study design
A descriptive study conducted at gynecological outpatients for visual inspection of cervix after application of 3\%-5\% acetic acid, a test otherwise known as the VIA test.

2.2 Study setting
This study was conducted at the outpatient clinic of the obstetrics and gynecology department in Mansoura University hospitals over a period of six months from June 2014 to December 2014.

2.3 Study subjects
Fifty female patients who attended the outpatient clinic of the obstetrics and gynecology department at Mansoura University hospitals in a period of six months selected according to inclusion and exclusion criteria.

2.4 Inclusion criteria
- Age is between 18 and 44 years.
- Free from any major medical or gynecological disorders.
- Complaining from any of cervical ectopy symptoms.
- Visiting gynecology clinics in Mansoura University hospitals.
2.5 Exclusion criteria

- Pregnant women.
- Previous history of hysterectomy.
- Previous history of treatment for cervical or uterine cancer.
- Women with active vaginal bleeding.

2.6 Study sample

A purposive sampling technique was used.

2.7 Tools of data collection

Two data collection tools (questionnaires) were used in this study:

1. Structured interview questionnaire sheet: a tool developed by the researchers after reviewing the national and international literatures consisted of three parts:
   - Part (1) Socio-demographic data of women aiming to assess general characteristics of the study group (name, age, educational level, occupation, residence, telephone no., monthly income, marital status, past medical history and family history).
   - Part (2) Obstetric and gynecological data aiming to assess the obstetric and gynecological history of the study group (age of menarche, cycle regularity, duration of menstruation, cycle length, presence of menorrhagia, dysmenorrhea or inter-menstrual bleeding, vaginal discharge characteristics, gravidity, parity, abortions and contraceptive use).
   - Part (3) Data aiming to assess the presence of cervical ectopy symptoms (vaginal discharge, lower abdominal pain, back ache, pruritus vulvae, post-coital bleeding, dyspareunia and inter-menstrual bleeding).

2. Local cervical assessment by VIA screening test: to assess the presence of cervical ectopy using direct visual inspection with 3%-5% acetic acid.
   - Cervix was painted with 3%-5% freshly prepared acetic acid solution using a sterile cotton swab. Cervix was inspected after 1 minute and the changes in surface epithelium were noted.
   - The test result was considered positive if at least one of the following criteria was present alongside acetowhiteness: rapid intake of acetic acid, slow loss of acetowhiteness, rough surface of the lesion and well-defined borders of the lesion.
   - The test result was considered negative if no acetowhite areas were observed or if there was a white area with all of the following criteria: slow intake of acetic acid, rapid loss of the white color, smooth surface of the lesion and ill-defined borders of the lesion.
   - Positive results were referred to the specialist for further assessment & management.

2.8 Validity

Tools used in this study were developed by the researchers after reviewing the current local and international related literatures using books, articles and scientific magazines. This helped them to be acquainted with the problem, and guided them in the process of tools designing. Tools were reviewed by three experts in the field.

2.9 Pilot study

Pilot study phase was conducted for one month (June 2014) at gynecological outpatient clinic of Mansoura University hospital on 20% of the sample size (10 patients) in order to test the applicability and relevance of the study tools and the clarity of the designed questionnaire and the necessary modifications were done. The pilot study sample was included in the study.

2.10 Ethical considerations

Ethical approval was obtained from research ethics committee of the faculty of nursing, Mansoura University. Oral informed consents were obtained from the participants included in the study sample. The participants were reassured about the confidentiality & privacy of the obtained information. The participants were also informed about their rights to refuse participations or withdraw at any time.

2.11 Field work

The actual field work of the study took place for 6 months period starting on June 2014 and ended on December 2014 to collect the data needed for assessment VIA test.

2.12 Procedure

- Data were collected using a sample from gynecological outpatients in Mansoura University hospitals which were chosen according to the inclusion and exclusion criteria.
- An official approval letter to carry out of study was obtained from the dean of faculty of nursing and the head of the Obstetrics and Gynecology department at Mansoura University Hospital.
- The researcher introduced herself to woman and the aim of study was explained prior their participation to obtain their acceptance & cooperation as verbal consent.
First the researcher introduced herself to women, took oral consent of them to be recruited in the study after explanation of the aim of study.

During the interview, the researcher clarified each item of the data collection sheet and explained its meaning to the patients. Patients were allowed to ask for any interpretation, elaboration or explanation.

The data were collected 3 days/week from 9 a.m. to 2 p.m. The results were then assessed and analyzed.

The researcher applied VIA test for cases complaining from symptoms of cervical ectopy by using the required materials. The researcher prepared the required Materials used for procedure such as:
- Sterile Sims speculum and anterior vaginal wall retractor.
- Sponge holding forceps and swaps.
- Normal saline.
- Acetic acid 3%-5% freshly prepared.
- Light source.
- Sterile Cusco’s speculum of different standard sizes
- Examination table.

Steps for application of the VIA Test:
- Explanation of the procedure and taking verbal consent.
- Patients were asked to lie down lithotomy position.
- Unaided visual inspection of cervix was first performed under good illumination and findings noted.
- Cervix was painted with 3%-5% freshly prepared acetic acid solution using a sterile cotton swab. Cervix was inspected after 1 minute and the changes in surface epithelium were noted.
- The test result was considered positive if at least one of the following criteria was present alongside acetowhitening: rapid intake of acetic acid, slow loss of acetowhiteing, rough surface of the lesion and well-defined borders of the lesion.
- The test result was considered negative if no acetowhite areas were observed or if there was a white area with all of the following criteria: slow intake of acetic acid, rapid loss of the white color, smooth surface of the lesion and ill-defined borders of the lesion
- Positive results were referred to the specialist for further assessment & management.

### 3. RESULTS

Socio-demographic characteristics of the women are shown in Table 1. It shows that 44% of the studied group were aged 20-30 years and 40% aged 31-40 years with a mean age of 33.7 ± 4.06 years. About half of them (48%) were average qualified in education. Regarding residence, it was found that 28% were from urban and 72% from rural area. About two third of them (64%) were married at age of 20-30 years and more than half (56%) were married for more than 10 years. The income was considered enough in 56% (see Table 1).

Regarding the age of menarche, it was found that more than half (56%) of the study group started menstruation at age > 12 years. Cycle was regular in 76%, its duration was within 4-5 days in 42% of patients and more than 5 days in 50%. Most of them (74%) had a length of cycle from 21-35 days. Menorrhagia was present in 32%, dysmenorrhea in 46% and inter-menstrual bleeding in 14% of the studied patients (see Table 2).

Table 3 shows frequency distribution of the obstetric history of the study group. It revealed that 58% got pregnant 1-3 times and 36% got pregnant 4 times and more. Also, 14% of the study group were nulliparous and 40% had no children. About two thirds (68%) have given birth 1-3 times and 52% had 1-3 children. Difficult deliveries were reported in 42% of the studied patients (all were CS). Abortion was reported in 34% of the studied patients. Management of abortion was spontaneous in 70.6%, medical in around 94% and surgical 76.5%, with considerable overlap between different management methods. Contraceptive use was reported in 76% of the study subjects (No = 38). Two thirds (65.8%) of the study subjects who used contraception reported using an IUD (see Table 3).

Table 4 shows the frequency distribution of vaginal discharge history of the study group. It shows that 98% of the studied women had a history of vaginal discharges, its color is watery (38.8%), whitish cheesy in 30.6%, yellowish in 22.4% and greenish in 8.2%. Its odor was offensive in 49% and the mount mild in around 43% and excessive in nearly half (49%) of the study group (see Table 4).
Table 1. Socio-demographic characteristics of the study group

| Items                        | No (n = 50) | Percent (%) |
|------------------------------|-------------|-------------|
| **Age groups**               |             |             |
| 20-30 years                  | 22          | 44.0        |
| 31-40 years                  | 20          | 40.0        |
| 41-45 years                  | 8           | 16.0        |
| **Mean age**                 | 33.7 ± 4.06 years |
| **Educational level**        |             |             |
| Illiteracy                   | 8           | 16.0        |
| Read/write                   | 13          | 26.0        |
| Qualified average            | 24          | 48.0        |
| University                   | 5           | 10.0        |
| **Occupations**              |             |             |
| House wife                   | 39          | 78.0        |
| Working                      | 11          | 22.0        |
| **Residence**                |             |             |
| Urban                        | 14          | 28.0        |
| Rural                        | 36          | 72.0        |
| **Marital status**           |             |             |
| Married                      | 50          | 100.0       |
| **Age at marriage**          |             |             |
| < 15 years                   | 1           | 2.0         |
| 15- years                    | 17          | 34.0        |
| 20-30 years                  | 32          | 64.0        |
| **Length of marriage**       |             |             |
| < 5 years                    | 6           | 12.0        |
| 5-10 years                   | 16          | 32.0        |
| > 10 years                   | 28          | 56.0        |
| **Woman habit**              |             |             |
| None                         | 50          | 100.0       |
| **Husband habits***          |             |             |
| Smoking                      | 42          | 84.0        |
| Drinking                     | 4           | 8.0         |
| Tramadol/drugs               | 4           | 8.0         |
| Hashish/Bango                | 3           | 6.0         |
| Married another              | 2           | 4.0         |
| **Income**                   |             |             |
| Enough                       | 28          | 56.0        |
| Enough and save              | 0           | 0.0         |
| Not enough                   | 22          | 44.0        |

*Non mutually exclusive.

Table 5 illustrates the frequency distribution of the present gynecological complaints of the study group. Women were complaining from vaginal bleeding in 42% and vaginal discharge in 98%. The color of discharge was watery in 28.6%, cheesy in 14.3%, yellowish in 53% and greenish in 4.1%. Its amount was reported to be mild in 51.0%, moderate in 6% and excessive in around 39% of the study group. Offensive odor was reported in nearly half (49.0%) of subjects. The studied women also complain from dyspareunia (92.0%), mostly deep seated 60.9%. 30% of studied patients were infertile; most of them secondary infertility (73.3%) and more than half of them (53.3%) had been infertile for 4-6 years. Nearly one-third of the studied subjects complained of post coital bleeding (34%) and its types were immediate in 64.7% and late in 35.3%. More than one third of the patients complained of back pain (36%), and more than half complained of lower abdominal pain (52%). Most sites of pain referral were to the back (64%) and lower abdomen (12.0%). Most of the patients complained of pruritus vulvae (see Table 5).

Table 2. Menstrual history of the study group

| Items                        | No (n = 50) | Percent (%) |
|------------------------------|-------------|-------------|
| **Age of menarche**          |             |             |
| < 9 years                    | 1           | 2.0         |
| 9-12 years                   | 21          | 42.0        |
| > 12 years                   | 28          | 56.0        |
| **Cycle regularity**         |             |             |
| Regular                      | 38          | 76.0        |
| Irregular                    | 12          | 24.0        |
| **Duration of menstrual period** |         |             |
| < 3 days                     | 1           | 2.0         |
| 4-5 days                     | 24          | 48.0        |
| > 5 days                     | 25          | 50.0        |
| **Length of the cycle**      |             |             |
| < 21 days                    | 0           | 0.0         |
| 21-35 days                   | 37          | 74.0        |
| > 35 days                    | 13          | 26.0        |
| **Menorrhagia**              |             |             |
| Yes                          | 16          | 32.0        |
| No                           | 34          | 68.0        |
| **Dysmenorrhea**             |             |             |
| Yes                          | 23          | 46.0        |
| No                           | 27          | 54.0        |
| **Inter-menstrual bleeding** |             |             |
| Yes                          | 7           | 14.0        |
| No                           | 13          | 86.0        |

3.1 VIA test results and analysis

Figure 1 illustrates the frequency distribution of the VIA test results among the study group according to number of positive signs. They show that 40% of the study subjects showed no positive signs at all while around one third of them showed two positive signs. Only 10% of the study group showed all of the five positive signs. Overall, 60% of the study subjects had positive VIA test results (see Figure 1).

Table 6 represents the validity of the VIA test compared to unaided clinical inspection of cervical ectopy. It clearly shows that clinical inspection was less valid than VIA test in the diagnosis of cervical ectopy. Sensitivity and specificity of VIA were found to be 90% and 45% respectively.
Table 3. Obstetric history of the study group

| Items                        | No (n = 50) | Percent (%) |
|------------------------------|-------------|-------------|
| **Gravidity**                |             |             |
| None                         | 3           | 6.0         |
| 1-3                          | 29          | 58.0        |
| ≥ 4                          | 18          | 36.0        |
| **Parity**                   |             |             |
| None                         | 7           | 14.0        |
| 1-3                          | 34          | 68.0        |
| ≥ 4                          | 9           | 18.0        |
| **Number of Normal Deliveries** |             |             |
| None                         | 20          | 40.0        |
| 1-3                          | 26          | 52.0        |
| ≥ 4                          | 4           | 8.0         |
| **Number of difficult deliveries*** |           |             |
| None                         | 29          | 58.0        |
| 1-2                          | 18          | 36.0        |
| ≥ 3                          | 3           | 6.0         |
| **Number of abortions**      |             |             |
| None                         | 33          | 66.0        |
| 1                            | 11          | 22.0        |
| 2                            | 5           | 10.0        |
| 3                            | 1           | 2.0         |
| **Treatment of abortions*** |             |             |
| Spontaneous                  | 12          | 70.6        |
| Medical                      | 16          | 94.1        |
| Surgical                     | 13          | 76.5        |
| **Contraceptive use**        |             |             |
| Yes                          | 38          | 76.0        |
| No                           | 12          | 24.0        |
| **Duration of contraceptive use** |         |             |
| < 1 year                     | 6           | 15.8        |
| 1-3                          | 21          | 55.3        |
| 4+                           | 11          | 28.9        |
| **If Yes, Types**            |             |             |
| Pills                        | 9           | 23.7        |
| Intrauterine Device          | 25          | 65.8        |
| Subdermal capsule            | 0           | 0.0         |
| Injections                   | 3           | 8.0         |
| Coitus interrupts            | 1           | 2.5         |

*All are Cesarean Sections; ** Non mutually exclusive.

Table 4. Vaginal discharge characteristics of the study group

| Items                        | No (n = 50) | Percent (%) |
|------------------------------|-------------|-------------|
| Vaginal discharge            |             |             |
| Yes                          | 49          | 98.0        |
| No                           | 1           | 2.0         |
| **Color**                    |             |             |
| Whitish watery               | 19          | 38.8        |
| Whitish cheesy               | 15          | 30.6        |
| Yellowish                    | 11          | 22.4        |
| Greenish                     | 4           | 8.2         |
| **Odor**                     |             |             |
| No odor                      | 25          | 51.0        |
| Offensive                    | 24          | 49.0        |
| **Amount**                   |             |             |
| Little                       | 2           | 4.1         |
| Mild                         | 21          | 42.9        |
| Moderate                     | 2           | 4.1         |
| Excessive                    | 24          | 49.0        |

Table 5. Present gynecological complaints of the study group

| Items                        | No (n = 50) | Percent (%) |
|------------------------------|-------------|-------------|
| **Presence of vaginal bleeding** |         |             |
| Yes                          | 21          | 42.0        |
| No                           | 29          | 58.0        |
| **Presence of vaginal discharge** |       |             |
| Yes                          | 49          | 98.0        |
| No                           | 1           | 2.0         |
| **Color of discharge**       |             |             |
| Whitish cheesy               | 7           | 14.3        |
| Watery                       | 14          | 28.6        |
| Yellow                       | 26          | 53.1        |
| Green                        | 2           | 4.1         |
| **Amount of discharge**      |             |             |
| Little                       | 2           | 4.1         |
| Mild                         | 25          | 51.0        |
| Moderate                     | 3           | 6.1         |
| Excessive                    | 19          | 38.8        |
| **Odor**                     |             |             |
| No odor                      | 24          | 49.0        |
| Offensive                    | 25          | 51.0        |
| **Presence of dyspareunia**  |             |             |
| Yes                          | 46          | 92.0        |
| No                           | 4           | 8.0         |
| **Types of dyspareunia**     |             |             |
| Deep                         | 28          | 60.9        |
| Superficial                  | 17          | 37.0        |
| Both                         | 1           | 2.1         |
| **Presence of infertility**  |             |             |
| Yes                          | 15          | 30.0        |
| No                           | 35          | 70.0        |
| **Infertility types**        |             |             |
| Primary                      | 4           | 26.7        |
| Secondary                    | 11          | 73.3        |
| **Duration of infertility**  |             |             |
| 2-3 years                    | 4           | 26.7        |
| 4-6 years                    | 8           | 53.3        |
| ≥ 7 years                    | 3           | 20.0        |
| **Post Coital bleeding**     |             |             |
| Yes                          | 17          | 34.0        |
| No                           | 33          | 66.0        |
| **Its types**                |             |             |
| Immediate                    | 11          | 64.7        |
| Late                         | 6           | 35.3        |
| **Pain**                     |             |             |
| Back                         | 18          | 36.0        |
| Lower abdomen                | 26          | 52.0        |
| Cervical                     | 6           | 12.0        |
| **Pain referral**            |             |             |
| Not referred                 | 7           | 14.0        |
| To back                      | 32          | 64.0        |
| To Lower abdomen             | 6           | 12.0        |
| To cervix                    | 5           | 10.0        |
| **Presence of pruritus vulvae** |        |             |
| Yes                          | 39          | 78.0        |
| No                           | 11          | 22.0        |
The positive predictive value of VIA was 71%, while the negative predictive value of VIA was 75%. The false positive finding of clinical inspection compared to VIA test was 29% while the false negative was 25%. It was also found that the accuracy of clinical inspection in comparison to VIA was 72% which means that VIA test was far superior and more accurate than simple clinical inspection by about 28% (see Table 6).

Table 6. Validity of visual inspection application in comparison to clinical inspection of the cervical ectopy

| Clinical Inspection | VIA results | Negative (n = 20) | Total |
|---------------------|-------------|-------------------|-------|
|                     | Positive (n = 30) | No. (20) | Percent (%) | No. (50) | Percent (%) |
| Positive            | 27 (54.0)    | 11 (22.0) | 38 (76.0)    |
| Negative            | 3 (6.0)      | 9 (18.0)   | 12 (24.0)   |
| Total               | 30 (60.0)    | 20 (40.0)  | 50 (100.0)  |

Figure 2 represents the pathological findings of the positive VIA test subjects’ specimens. They show that findings of the VIA test were in agreement with pathological findings. All cases diagnosed positive by VIA gave pathological findings. It means that the sensitivity of the VIA in detecting various types of cervical lesions is 100% and no false positive (i.e., no normal cervical histology was VIA positive) (see Figure 2).

3.2 Correlation of VIA test results with socio-demographic characteristics

There were significant differences between the group of women with positive VIA results than women with negative VIA results as regard to age and period of marriage. Positive results were significantly higher among age group 31-40 years (60%) and with longer duration of marriage than 10 years (70%) (P is .002 and .046 respectively). There was no significant difference of other socio-demographic characteristics in both groups such as educational level, occupations, residence, age at marriage and husband’s habits which were nearly similar in VIA positive and VIA negative groups (P > .05) (see Table 7).

3.3 Correlation between obstetric history of the study group and VIA test results

The percentage of positive VIA result was higher among women with ≥ 4 gravidity, ≥ 4 parity, 1-3 full term normal deliveries and without difficult deliveries compared to those with VIA negative result but the difference was statistically insignificant (P > .05). Regarding contraceptive use, VIA positive results were significantly higher among patients with current use of contraceptive methods especially among women who had been using contraception for 1-3 years (75%). IUDs use was highly associated with positive VIA results. Nearly 80% of women who tested positive for VIA have reported using IUD as their primary method of contraception (see Table 8).
**Figure 2.** Pathological Findings of the positive VIA test subjects

**Table 7.** Relationship between socio-demographic characteristics of the study group and VIA test results

| Items          | VIA positive (n=30) | VIA negative (n = 20) | Significance test |
|----------------|--------------------|-----------------------|------------------|
|                | No (30) | Percent (%) | No (20) | Percent (%) | χ² | Significance |
| Age groups     |         |             |         |             |    |   |
| 20-30 years    | 8       | 26.7        | 14      | 70.0        | 12.95 | P = .002 |
| 31-40 years    | 18      | 60.0        | 2       | 10.0        |      |   |
| 41-45 years    | 4       | 13.3        | 4       | 20.0        |      |   |
| Educational level |       |             |         |             |    |   |
| Illiteracy     | 3       | 10.0        | 5       | 25.0        | 5.831 | P = .120 |
| Read/write     | 11      | 36.7        | 2       | 10.0        |      |   |
| Qualified average | 14  | 46.7        | 10      | 50.0        |      |   |
| University     | 2       | 6.7         | 3       | 15.0        |      |   |
| Occupations    |         |             |         |             |    |   |
| House wife     | 23      | 76.7        | 16      | 80.0        | 0.078 | P = .783 |
| Working        | 7       | 23.3        | 4       | 20.0        |      |   |
| Residence      |         |             |         |             |    |   |
| Urban          | 8       | 26.7        | 6       | 30.0        | 0.066 | P = .797 |
| Rural          | 22      | 73.3        | 14      | 70.0        |      |   |
| Age at marriage|         |             |         |             |    |   |
| < 15 years     | 0       | 0.0         | 1       | 5.0         | 0.067 | P = .776 |
| 15- years      | 10      | 33.3        | 7       | 35.0        |      |   |
| 20-30 years    | 20      | 66.7        | 12      | 60.0        |      |   |
| Length of marriage |   |        |         |             |    |   |
| < 5 years      | 2       | 6.7         | 4       | 20.0        | 6.163 | P = .046 |
| 5-10 years     | 7       | 23.3        | 9       | 45.0        |      |   |
| > 10 years     | 21      | 70.0        | 7       | 35.0        |      |   |
| Husband habits*|         |             |         |             |    |   |
| Smoking        | 27      | 90.0        | 15      | 75.0        | 2.01 | P = .156 |
| Drinking       | 1       | 3.3         | 3       | 15.0        | 0.289 | FET, P = .289 |
| Tramadol/drugs | 2       | 6.7         | 2       | 10.0        | 0.528 | FET, P = .528 |
| Hashish/Bango  | 2       | 6.7         | 1       | 5.0         | 0.651 | FET, P = .651 |
| Married another | 0     | 0.0         | 2       | 10.0        | 0.155 | FET, P = .155 |
| None           | 3       | 10.0        | 5       | 25.0        | 0.153 | FET, P = .153 |
| Income         |         |             |         |             |    |   |
| Enough         | 18      | 60.0        | 10      | 50.0        | 0.487 | P = .485 |
| Not enough     | 12      | 40.0        | 10      | 50.0        |      |   |

* Non mutually exclusive; FET: Fisher Exact test.
### Table 8. Relationship between obstetric history of the study group and VIA test

| Items                        | VIA positive (n = 30) | VIA negative (n = 20) | Significance test |
|------------------------------|----------------------|-----------------------|-------------------|
|                              | No (30)              | Percent (%)           | No (20)           | Percent (%)       | χ²          | P       |
| Gravidity                    |                      |                       |                   |                   |            |         |
| None                         | 1                    | 3.3                   | 2                 | 10.0              | 1.245      | .589    |
| 1-3                          | 17                   | 56.7                  | 12                | 60.0              |            |         |
| ≥4                           | 12                   | 40.0                  | 6                 | 30.0              |            |         |
| Parity                       |                      |                       |                   |                   |            |         |
| None                         | 4                    | 13.3                  | 3                 | 15.0              | 1.449      | .468    |
| 1-3                          | 19                   | 63.3                  | 15                | 75.0              |            |         |
| ≥4                           | 7                    | 23.3                  | 2                 | 10.0              |            |         |
| Number of FTND               |                      |                       |                   |                   |            |         |
| None                         | 8                    | 26.7                  | 12                | 60.0              | 5.561      | .069    |
| 1-3                          | 19                   | 63.3                  | 7                 | 35.0              |            |         |
| ≥4                           | 3                    | 10.0                  | 1                 | 5.0               |            |         |
| Number of difficult deliveries|                      |                       |                   |                   |            |         |
| None                         | 20                   | 66.7                  | 9                 | 45.0              | 2.842      | .216    |
| 1-2                          | 8                    | 26.7                  | 10                | 50.0              |            |         |
| ≥3                           | 2                    | 6.7                   | 1                 | 5.0               |            |         |
| Contraceptive use            |                      |                       |                   |                   |            |         |
| Yes                          | 24                   | 80.0                  | 14                | 70.0              | 0.658      | .417    |
| No                           | 6                    | 20.0                  | 6                 | 30.0              |            |         |
| Duration of use              |                      |                       |                   |                   |            |         |
| < 1 years                    | 1                    | 4.2                   | 5                 | 35.7              | 7.712      | .17     |
| 1-3                          | 18                   | 75.0                  | 3                 | 21.4              |            | .017    |
| ≥4                           | 5                    | 20.8                  | 6                 | 42.9              |            |         |
| Contraception types          |                      |                       |                   |                   |            |         |
| Pills                        | 4                    | 16.7                  | 5                 | 35.7              | 1.75, P = .186 |         |
| IUDS                         | 19                   | 79.2                  | 6                 | 42.9              | 0.53, P* = .017 |         |
| Subdermal capsule            | 0                    | 0.0                   | 0                 | 0.0               | FET, P = .152 |         |
| Injection                    | 1                    | 4.1                   | 2                 | 14.3              |          FET, P = .247 |         |
| Coitus interrupts            | 0                    | 0.0                   | 1                 | 7.1               |          FET, P = .600 |         |

*P* < .05.

3.4 Correlation between present gynecological complaints and the VIA test results

The post coital bleeding was significantly higher among patients with positive VIA results (50%) than those with negative results (20%) (*P* = .002), especially the late post coital bleeding. As regard complaining of pain, the percentage of lower abdominal and cervical type and that referred to lower abdomen and cervix was significantly higher in VIA positive patients (*P* = .016 and *P* = .013 respectively). There was no significant difference in percentage between those complaining of pruritus vulvae in VIA positive or negative patients (*P* > .05) (see Table 9).

4. Discussion

The symptoms of cervical ectopy or cervical neoplasia have a significant overlap with each other and with other common gynecological conditions. Vaginal discharge or bleeding, postcoital bleeding and other symptoms like backache & dyspareunia can occur in a variety of gynecological diseases, either acute or chronic. Hence there is a great need for an affordable and easy way to use method of screening to detect suspicious cases for further assessment. Equally important is the detection of negative cases which will help saving the cost of unnecessary laboratory or histopathological interventions.[9]

In the present study, the findings of VIA test were in agreement with pathological findings. All cases diagnosed positive by VIA gave pathological findings. It means that the sensitivity of the VIA in detecting various types of cervical lesions is 100% and no false positive (i.e., no normal cervical histology was VIA positive). This finding strongly supports the study research question about the role of direct visual inspection of the cervix using 3%-5% acetic acid for the detection of cervical ectopy.[7]

Regarding socio-demographic data of the study group, it was found that 44% of them ranged from 20-30 years old with mean age 33.7 years. This result was in agreement with Cronje et al., 2001[10] who reported in their study about screening for cervical neoplasia in a developing country utilizing cytology, cervicography and the acetic acid test that their study sample had a mean age of 34.4 years. It was also
in agreement with Dhaubhadel et al. (2008)\textsuperscript{[14]} who reported in their study about early detection of cervical cancer precursors of cervical cancer by visual inspection of cervix with acetic acid that their study sample had a mean age of 31.1 years. However, this result was in disagreement with Kavita & Shefali, 2010\textsuperscript{[11]} who reported in their study about visual inspection of cervix with acetic acid (VIA) in early diagnosis of cervical intraepithelial neoplasia (CIN) and early cancer cervix that their study sample had a higher mean age of 38.2 year.

### Table 9. Relationship between present gynecological complaints and the VIA test results

| Items                        | VIA positive (n = 30) | VIA negative (n = 20) | Significance test |
|------------------------------|----------------------|-----------------------|------------------|
| Presence of infertility      |                      |                       |                  |
| Yes                          | 4                    | 11                    | $\chi^2 = 10.204$ |
| No                           | 26                   | 9                     | $P* = .004$      |
| Infertility types            |                      |                       |                  |
| Primary                      | 1                    | 3                     | $FET, P = .725$  |
| Secondary                    | 3                    | 8                     |                  |
| Duration of infertility      |                      |                       |                  |
| 2-3 years                    | 2                    | 2                     | $\chi^2 = 1.520$ |
| 6                            | 2                    | 6                     | $P = .217$       |
| 7+                           | 0                    | 3                     |                  |
| Post Coital bleeding         |                      |                       |                  |
| Yes                          | 15                   | 2                     | $\chi^2 = 9.78$  |
| No                           | 15                   | 18                    | $P* = .002$      |
| Its types                    |                      |                       |                  |
| Immediate                    | 15                   | 2                     |                  |
| Late                         | 6                    | 18                    |                  |
| Pain                         |                      |                       |                  |
| Back                         | 7                    | 11                    | $\chi^2 = 7.657$ |
| Lower abdomen                | 17                   | 9                     | $P* = .016$      |
| Cervical                     | 6                    | 0                     |                  |
| Pain referral                |                      |                       |                  |
| Not referred                 | 1                    | 6                     | $\chi^2 = 10.148$|
| To back                      | 19                   | 13                    | $P* = .013$      |
| To Lower abdomen             | 5                    | 1                     |                  |
| To cervix                    | 5                    | 0                     |                  |
| Presence of pruritus vulvae  |                      |                       |                  |
| Yes                          | 23                   | 16                    | $\chi^2 = 0.078$ |
| No                           | 7                    | 4                     | $P = .780$       |

$P* < .05$.

As regards to age of marriage and its duration, the findings of the present study revealed that two thirds of the study group were married at age of 20-30 years and more than half of them were married for more than 10 years. These findings were in disagreement with the findings of Lunt, 1984\textsuperscript{[12]} who reported in his study about worldwide early detection of cervical cancer that the average age of marriage was 18 years.

Regarding obstetric and gynecological history of the study group, the most common gynecological complaint in the present study was vaginal discharge. This finding may be interpreted by the fact that the majority of the study sample had cervical ectopy and vaginal discharge is known to be the most common symptom associated with cervical ectopy. This finding was in agreement with Suman, 2013\textsuperscript{[13]} who also found that white discharge per vagina was the most common presenting complaint in his study group.

On the contrary, this result was in disagreement with Dhaubhadel et al. (2008) who reported pelvic pain to be the most common complaint in more than half of their study sample followed by vaginal discharge. Possible explanation for that difference is that Dhaubhadel et al. (2008) concentrated on cancerous lesions in particular which may present first as painful conditions rather than presenting solely with vaginal discharge.\textsuperscript{[14]}

As regards to VIA test results, VIA test was positive in about two thirds of the study subjects. This result was in agreement with Suman (2013)\textsuperscript{[13]} who reported positive VIA in also about two thirds of his sample. It was also in agreement with Wesley et al. (1997) who reported in their study about
evaluation of visual inspection as a screening test for cervical cancer that VIA test was positive in half of their sample.[15]

On the other hand, this result was in disagreement with the findings of Kavita et al. (2010)11 who reported positive VIA test in less than one fifth of their study subjects and also with the findings of Ghaemmaghami et al. (2004)16 who reported in their study about “visual inspection with acetic acid as a feasible screening test for cervical neoplasia” that VIA test was positive in only less than one fifth of their study sample.

In the present study the sensitivity of VIA test was found to be 100% as all positive VIA samples yielded positive history-pathological results. In relation to simple clinical inspection it was found that the sensitivity of VIA reached 90%. These findings were in agreement with Sankaranarayanan et al. (1999)8 who reported in their study about visual inspection with acetic acid in the early detection of cervical cancer and precursors that VIA test had a sensitivity of 96%. Within the same line, Goel et al. (2005)17 in their study about “visual inspection of the cervix with acetic acid for cervical intra-epithelial lesions” reported that VIA sensitivity was 96.7%. too. All these findings and the results of the present study confirm the high sensitivity of VIA test reported all over the literature and highlight its effective role in the diagnosis of cervical ectopy.

On the other hand, specificity of VIA in the present study was estimated to be 45%. This result is in agreement with the findings of Vadehra & Jha (2006)18 who reported VIA specificity to be 37.5%. It was also in agreement with the findings of Cronje et al. 2003 who reported in their study about comparison of four screening methods for cervical neoplasia in a developing country that the specificity of VIA was 48.5%.19 However this result was in disagreement with the findings of Sankaranarayanan et al. (1999) & Sankaranarayanan et al. (2003)8,20 who reported a much higher VIA specificity of 65% & 81.9%, respectively.

Regarding the correlation between socio-demographic characteristics of the study group and VIA test results, it was found that positive results were significantly higher among age group 31-40 years and with longer duration of marriage than 10 years. This means that prolonged sexually active period can be a risk factor for developing cervical ectopy and therefore cervical metaplasia. This result was in agreement with Bansal (2009)9 who reported that women married for more than thirty years are 1.97 times more likely to have precancerous lesions in the cervix. No correlation was found between other socio-demographic characteristics of the study group such as educational level, occupation, residence, age of marriage or husband’s habits and VIA test results.

High parity was a risk factor for VIA positivity in the present study especially parity more than 4 times. This is in concordance with the findings of Bansal (2009) who also found that women with more than 4 parities are 2.1 times more likely to have precancerous lesions.[9]

Another important finding of the present study was that IUDs use is highly associated with positive VIA results. The majority of the overall positive results used or were using an IUD as their primary method of contraception. The use of IUDs may be associated with cervical trauma and inflammation which could lead to cervical ectopy, cervical dysplasia and even cervical malignancy. These findings were in disagreement with Wright et al. (2014)4 study about “cervical ectropion and intra-uterine contraceptive device (IUCD): a five-year retrospective study of family planning clients of a tertiary health institution in Lagos Nigeria”, in which only about one tenth of the study subjects had cervical ectopy despite the fact that all of them used an IUD.

As regards to the relationship between gynecological complaints and VIA test results, no statistically different correlation was found between any of the present complaints such as vaginal bleeding, vaginal discharge, abdominal pain or any other complaint and the VIA test result. This was in agreement with all he studies the researcher found on cervical ectopy and VIA test especially Bansal (2009) and Suman (2013)9,13 who found insignificant correlation between gynecological symptoms and VIA test results.

Also no correlation was found between past medical history of the study group or cervical procedures and VIA test results. However, the percentage of IUDs use was higher among the VIA positive subjects as mentioned above so a relationship between IUDs use and cervical ectopy should be suspected and further studies are needed on this subject. Also no significant correlation was found between results of cervical evaluation of the study group and VIA test results. The researcher could not find relevant studies correlating cervical examination with VIA test results to compare these findings with them.

5.  CONCLUSION

Based on the results of the present study, the following conclusion can be considered: Generally, the findings of the present study reveal that using vinegar acetic acid (VIA test) is an accurate and effective method for evaluating of cervical ectopy. It can be used with high efficacy in low resource environment and has been proven to achieve high sensitivity with an acceptable specificity.
5.1 Recommendations

Based on the results of the present study, the following is recommended:

- Application of training programs for health care providers especially specialist nurses to increase their awareness about the importance of VIA test for early detection of cervical ectopy.
- Direct visual inspection of the cervix using 3%-5% acetic acid (VIA test) should be the preferred means of screening for cervical ectopy and other premalignant cervical lesions due to its high sensitivity and low cost.
- In low resource environment and in developing countries like Egypt, the use of VIA test should be encouraged as the primary screening method for cervical ectopy.
- VIA test should be performed for all women attending outpatient gynecological clinics even in the presence of Pap smear facility to improve detection rate of cervical lesions and provide better patient counseling and treatment.

5.2 Limitation of the study

The present study has some limitations. For example, the sample of this study was selected from women attending outpatient clinics Mansoura University hospitals. This may not be available for the general population and the use of the VIA test as a screening tool in the general population may not achieve the sensitivity or the specificity estimated in this study.

ACKNOWLEDGEMENTS

Thanks a lot for all women included in the study, and for the health care workers (medical and nursing staff) working at Mansoura University obstetrical & gynaecological outpatient clinic for their cooperation during the study.

REFERENCES

[1] Machado Junior LC, Dalmaso AS, Carvalho HB. Evidence for benefits from treating cervical ectopy: Literature review. Sao Paulo Med J. 2008; 126(2): 132-9. PMid:18553039
[2] Myer L, Denny L, Telerant R, et al. Bacterial vaginosis and susceptibility to HIV infection in South African women: A nested case-control study. J Infect Dis. 2005; 192(8): 1372-80. PMid:16170754 http://dx.doi.org/10.1086/462427
[3] Stamatellos I, Stamatopoulos P, Bontis J. The role of hysteroscopy in the current management of the cervical polyps. Arch Gynecol Obstet. 2007; 276(4): 299-303. PMid:17653740 http://dx.doi.org/10.1007/s00404-007-0417-2
[4] Wright KO, Mohammed AS, Salisu-Olatunji O, et al. Cervical Ectropion and Intra-Uterine Contraceptive Device (IUCD): A five-year retrospective study of family planning clients of a tertiary health institution in Lagos Nigeria. BMC Research Notes. 2014; 7: 946. PMid:25539789 http://dx.doi.org/10.1186/1756-0500-7-946
[5] Singh R, Legnain MM. Profile of oral contraceptive and intrauterine device users at Benghazi. Malays J Reprod Health. 1990; 8(1): 5-12. PMid:12316343
[6] Lakshmi S, Rema P, Somanathan T. P16ink4a is a surrogate marker for high-risk and malignant cervical lesions in the presence of human papillomavirus. Pathobiology. 2009; 76(3): 141-8. PMid:19468254 http://dx.doi.org/10.1159/000209392
[7] Ottaviano M, La Torre P. Examination of the cervix with the naked eye using acetic acid test. Am J Obstet Gynecol. 1982; 143(2): 139-42. PMid:7081324
[8] Sankaranarayanan R, Wesley R, Thara S, et al. Test characteristics of visual inspection with 4% acetic acid (VIA) and Lugol’s iodine (VILI) in cervical cancer screening in Kerala, India. Int J Cancer. 2003; 106(3): 404-8. PMid:12845681 http://dx.doi.org/10.1002/ijc.11245
[9] Bansal V. Visual inspection with acetic acid as a predictor of precancerous lesions of cervix. MD thesis. India: Rajiv Gandhi University; 2009.
[10] Cronjé HS, Cooreman BF, Beyer E, et al. Screening for cervical neoplasia in a developing country utilizing cytology, cervicography and the acetic acid test. Int J Gynaecol Obstet. 2011; 117(3): 259-64. http://dx.doi.org/10.1016/j.ijgo.2011.03.002
[11] Kavita SN, Shefali M. Visual inspection of cervix with acetic acid (VIA) in early diagnosis of cervical intraepithelial neoplasia (CIN) and early cancer cervix. J Obstet Gynaecol India. 2010; 60(1): 55-60. http://dx.doi.org/10.1007/s13224-010-0610-7
[12] Lunn R. Worldwide early detection of cervical cancer. Obstet Gynecol. 1984; 63: 708. PMid:6718785
[13] Suman K. Evaluation of Pap smear and acetic acid test as cervical cancer screening tools- with histopathological correlation. MD thesis., Karnataka, India: Rajiv Gandhi University; 2013.
[14] Dhaubhadel P, Vaidya A, Choudhary P. Early detection of precursors of cervical cancer with cervical cytology and visual inspection of cervix with acetic acid. JIMA J Nepal Med Assoc. 2008; 47(170): 71-6. PMid:18709035
[15] Wesley R, Sankaranarayanan R, Mathew B, et al. Evaluation of visual inspection as a screening test for cervical cancer. Br J Cancer. 1997; 75(3): 436-40. http://dx.doi.org/10.1038/bjc.1997.72
[16] Ghaemmaghami F, Behnash N, Modares GM, et al. Visual inspection with acetic acid as a feasible screening test for cervical neoplasia in Iran. Int J Gynecol Cancer. 2004; 14(3): 465-9. PMid:15228419 http://dx.doi.org/10.1111/j.1048-891x.2004.14306.x
[17] Goel A, Gandhi G, Batra S, et al. Visual inspection of the cervix with acetic acid for cervical intraepithelial lesions. Int J Gynaecol Obstet. 2005; 88(1): 25-30. PMid:15617701 http://dx.doi.org/10.1016/j.ijgo.2004.09.018
[18] Vadehra K, Jha R. Visual inspection using acetic acid and Pap smear as a method of cervical cancer screening. Journal of Institute of Medicine. 2006; 28(1): 36-40.
[19] Cronjé HS, Parham GP, Cooreman BF, et al. A comparison of four screening methods for cervical neoplasia in a developing country. Am J Obstet Gynecol. 2003; 188(2): 395-400. PMid:12592246 http://dx.doi.org/10.1067/mob.2003.153
[20] Doh AS, Nkele NN, Achu P, et al. Visual inspection with acetic acid and cytology as screening methods for cervical lesions in Cameroon. Int J Gynaecol Obstet. 2005; 89(2): 167-73. PMid:15847890 http://dx.doi.org/10.1016/j.ijgo.2004.12.040