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Efficacy of Training Program on Detectionof Cervical Cancer using Visual Inspection with Acetic Acid by Nursesversus Clinicians

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Abstract:In low-resource settings, the dearth of national screening programmes, lack of equipment and skilled technicians led to limitation of women' access to cytology screening programmes. For that bridging the human resource gap with using low-cost methods have been implemented for screening, where resourceful visual inspection with acetic acid (VIA) by trained nurses and doctors is the most common approach. ***Aim:***to assess the efficacy of training program on early detectionofcancer cervix using visual inspection with acetic acid (VIA) by nurses compared to junior clinicians. ***Setting:*** It was conducted at early detection clinic for cervical cancer in Women's Health Hospital (WHH) at Assiut University, Egypt. ***Design:***Quasi-experimental research design.***Participants:*** A total of 100 eligible women who fulfilled the selection criteria underwent VIA done by 20 nurses and junior clinicians (10 for each). ***Tools:*** Three tools used: A structured interview; Pre-posttest Cervical Cancer knowledge Questionnaire and Observation Checklist. ***Method:***A three weeks of intensive VIA training program for 20 nurses and clinicians prior start in clinical examination of the participants, the findings of VIA were interpreted independently. A colposcopy was carried out by a gynecologist blinded to the results of VIA and a directed biopsy was taken if indicated. ***Results:*** The findings delineated an improvement in knowledge concerning cancer cervix for both nurses and junior clinicians with no significant difference between both of them. For accuracy the nurse VIA had shown good diagnostic rate equivalent to clinician VIA as compared to colposcopy.***Conclusion & Recommendation:***Nurses had reasonable knowledge concerning cervical cancer as well as junior clinicians and with proper intensive training nurses can perform VIA test with acceptable accuracy regarding most steps of VIA with high sensitivity and specificity to clinicians in addition to the availability during their schedule work compared to clinicians.An intensive training and periodic reinforcement sessions are needed to slightly limit the false positive predictive value among nurses.

Key words: Training Program, Early Cervical Cancer Detection, Nurses, Physicians, VIA

INTRODUCTION

Cervical cancer signifies the 4th most common cancer in women worldwide and it represents the 3rd in the developing countries, and is accused for representing 80% of those attacked with cervical cancer cases worldwide **(Adams &Carnright, 2013; Eze et al., 2012; Sabir et al., 2013)** and unfortunately 85% of cervical cancer deaths occurredannually**(Eze et al., 2012&World Health Organization, 2013). (Jemal et al 2010; Pierce Campbell et al, 2012).** Concerning the mortality related cervical cancer, it was varied significantly between developed and developing countries and ranged from (less than 2/100 000 to more than 20/100 000 respectively).According to the International Agency for Research on Cancer (IARC's), it was predicted that deaths from cervical cancer will continue to rise for the upcoming eras(**Prat&Franchesci (2014); Ferlay et al (2010)**.

For achieving more better results concerning cervical cancer screening especially in limited resource areas, a simple, cost effective screening methods such as visual inspection with acetic acid (VIA) has been considered as alternative screening test, diagnostic, technically simple tests than cytology, assist in treatment and be accessible to most women either be provided on-site or in clinics**(Denny et al, 2006; Sankaranarayanan et al, 2004)**.In concordance with these findings several studies proved the same benefits of using efficient alternative VIA to cytological testing **(Atef, et al, 2015; Sauvaget et al, 2012; Ibrahim et al, 2011; Moon et al 2012)**

Moreover, **Murray et al, 2012** added that mostly in low- and middle-income countries (LMICs**)** cervical cancer causes early death and diseases related disabilities for years which in turn can lead to the worldwide loss of 6.4 million disability-adjusted life years (DALYs) in 2010. In this respect, **Saslow, et al (2012)** emphasized that increasing screening rates among women rarely or never screened would be responsible on great improvement in minimizing cervical cancer incidence and mortality. Similarly, **Surendra et al (2014)** who established a randomized controlled study to assess the effect of VIA Screening by Primary Health Workers (PHW) and found a significant cases of pervasive cancers detected by VIA in the screening group compared to less prominent diagnosed cases in the control group and the majority of those in the screening

group compliance to treatment, this percent detect high compliance among screened than control group.So it is the strategy of Screen & Treat approach with VIA and Cryotherapy **(WHO, 2013).**

In spite of the successful achievement of reducing the rates of cervical cancer in high-resource settings by implementing cervical cytology screening programs, The view is totally different in the low- resource setting, in which nonexistence of national screening programs, lack of equipment and trained technicians led to limited number of women have access to cytology screening programs**(Vaccarella et al, 2013),** moreover, **Zug & Grube (2014)**added thatnearly 50% of those who have cervical cancers had never been screened, the majority of them are poor, resident in rural areas, and have limited access to health care workers (HCWs) and infrastructure.

To reduce the risk of overtreatment, proper training on using VIA by nurses and physicians have been applied, so VIA positive women are referred for colposcopy. **(Nessa et al, 2010&Sauvaget et al, 2011)** As supporting to all previous studies, the **World Health Organization (2011)** established a description for screening with VIA as a ''*best buy*,'' which displays both highly cost-effective and practicable to apply it in settings with organized health systems. Confirming this assumption **Sankaranarayanan et al (2012 & 2009)** reported from large trials that VIA can reduce cervical cancer incidence by 25%–30%.

Concerning the probability of introducing VIA screening as a low resource method by trained health care workers **Basu et al (2002)** reported that it has been a subject of argument for over a decade. VIA can be performed by clinicians as well as trained nurses as a one-stop diagnostic tool, in addition to nurses have a vital role in health education and in rising awareness of the target population regarding the early cancer cervix screening especially in developing countries, they need to be well prepared by constantly updated and sustained knowledge and practice. **(Atef, et al 2015; Rosen et al, 2016 &Dany et al, 2015)**.

In this respect, **Surendra et al (2014)**proved that an intensive training program applied for a duration of 4 weeks given to primary health workers (PHWs) who can be equipped to perform cervical cancer screening by VIA effectively, their performance recorded good agreement with those who are expert ($\kappa = 0.84$). Moreover, their study provides undoubted evidence of the effectiveness of VIA performed by PHWs in minimizing cervical cancer mortality in limited-resource situations.

Furthermore, the nurse constitutes the chiefly health care provider who interact with eligible women came for cervical cancer screening and hence the responsibility is on health care workers who offer screening or refer them to a reference center where specialized test can be done **Singh et al (2012)**.

Significance of the study:

To meet distinct program objectives, it is essential to equip health care providers with the appropriate background and experience. For that, clinical trainers should have two different skill sets. First, they must have the ability to communicate effectively and to convey both theoretical and practical knowledge to be able to assess and adapt the training to get-up the needs of individual cervical cancer prevention service. Second; they must acquire the clinical practice to manipulate procedures like VIA effectively, this research was applied to handle properlyavailable human resources by restructuring specific tasks from highly qualified specialists of performing the assignment safe and reliably to be done by non-physician clinicians (NPC) such as nurses, thus bridging the human resource gap especially with loaded schedules as clinicians. **ACOG (2004)**

Aim of the study

The aim of this study was to to assess the efficacy of training program on early detection of cancer cervix using visual inspection with acetic acid (VIA) by nurses compared to junior clinicians.

Hypotheses:

H0. The well trained nurse and junior clinician dont exhibit a reasonable agreement level to the practice regarding VIA steps, sensitivity and specificity of the test.

H1. The study group subjects represented in nurses and junior clinicians who exposed to the extensive training program exhibit more mean knowledge score compared to the pre-test result and a superior sensible knowledge level among junior clinician compared to nurses before receiving the program.

H2. The well trained nurse exhibits a reasonable agreement level to the practice of the junior clinician concerning the VIA steps, sensitivity and specificity of the test.

Subjects & Methods

Design:Quasi experimental research design was used in this study**.**

Setting: The study was conducted at early detection clinic for cervical cancer in Women's Health Hospital (WHH) at Assiut University, Egypt. This hospital was chosen as it serves the Upper Egypt area and it had high turnover patients who had received obstetrics & gynecological services.

Participants:A total of 100 eligible women who fulfilled the selection criteria underwent VIA by both a total of 20 healthcare providers (10 nurses and junior clinicians each) after receiving a three weeks VIA training program prior start in clinical examination.

Inclusion criteria:Patients complained of persistent vaginal discharge, inter-menstrual bleeding,post coital bleeding or with an unhealthy cervix on examination were invited to participate in a cancer-screening programme.

Exclusion criteria:Not eligible; <30 years of age; current vaginal bleeding, prior hysterectomy or, procedure on cervix; any previous gynecological examinations less than 1 week, unmarried; pregnancy; and obvious growth on cervix. Women who chose not to complete other investigation as colposcopy examination in case of positive VIA.

Study tools:

Tools: Three tools were used for data collection:

Tool (I) A structured interview schedulewhich included sociodemographic data, gynecological data, age at first coitus for the women who accepting to participate in the study, further, general characteristics of the health care providers which denotes previous attending workshop related cervical cancer, etc……..

Tool (II) Pre-posttest Cervical Cancer knowledge Questionnaire: This tool used two times prior starting the training program, then the same tool was used at the end of the training days. It was developed and used by the researcher after reviewing the related literatures to assess the health care provider's knowledge related to cervical cancer. It included questions concerning causes, risk factors, signs and symptoms of cervical cancer, types, and methods of early detection, diagnosis and management.

Tool (III): Observation Checklist: It was developed and used by the researchers to assess the performance and the accuracy of performing VIA steps by nurses versus clinicians and it included all the steps required to perform the VIA technique and ended by the documentation of the VIA results either positive or negative based on the IRAC criteria; In which VIA positive delineates any of the following criteria:

Well defined, sharp, distinct, dense aceto-white areas with or without raised margins;adjacent to the squamo-columnar junction in the transformation zone; strikingly dense acetowhite area in the columnar epithelium and/or condyloma and leukoplakia occurring closer to the squamo-columnar junction turning intensely white after application of acetic acid.While VIA negative presents any of the following criteria:

No acetowhite lesions on the cervix; polyps protruding from the cervix with bluish-white acetowhite areas, nabothian cysts appearing as button-like areas/whitish acne, or pimples; faint line-like or ill-defined acetowhitening at squamocolumnar junction; Shiny, pinkish-white, cloudy-white, bluish-white, faint patchy, or doubtful lesions with ill-defined, indefinite margins, blending with the rest of the cervix; Angular, irregular, digitating, acetowhite lesions resembling geographical regions, far away from the transformation zone (satellite lesions); ill-defined, patchy, pale acetowhite areas in the inflamed, unhealthy, ulcerated cervix with bleeding and mucopurulent discharge; red spots on cervix against pinkish-white background after applying acetic acid; streak-like acetowhitening in the columnar epithelium; Dot-like areas in the endocervix, which are due to grape-like columnar epithelium staining with acetic acid **Sankaranarayanan et al (2003)**.

Pilot study:A pilot study was conducted on 10 % of the study sample and was not involved in the sample to ensure stability of the answers, to test the readability of the questionnaire and the applicability of observational checklist. It also helped to estimate the time needed to complete the questionnaire and checklist (30-40 minutes).

Tool validity: The present study tools were handed to five juries who are academic nursing experts in the obstetrics &gynecological nursing and expert in gynecology field to test the face and content validity of the tools; necessary modifications were carried out based on their judgment on clarity of sentences, the order in which they are presented to maintain consistency and the appropriateness of the content and minor modification in the observational checklist concerning its score to be categorized as done equal 1 and not done equal 0 not being categorized as 0,1,2. Some repeated questions omitted, the result of CVI revealed strongly accepting the tools, it measured (0.85).

Tool reliability: Internal consistency had been used for the knowledge questionnaire (tool II) and its Cronbach's alpha revealed 0.82. For the observational checklist (tool III), an estimation of interrater (or interobserver) reliability are obtained to assess the equivalence reliability in which their degree of agreementranged from 85% to 100%. Moreover,the researchers used the reliable tool to assess the result of VIAeither positive or negative based on the IRAC criteria.**Sankaranarayanan et al (2003)**.

Ethical approval:

The study was reviewed and approved by Ethics Review Committee at Assiut University. An official permissions and approvals obtained from hospital administration, chairman of OBGYN department, director of outpatient clinics and chairman of nursing administration. An informed oral consent was taken from the women to participate in the study as forty percent of them were illiterate. Before the woman participation in the research, she notified about the aim, methods,screening techniques, anticipated benefits and potential hazards of the research, her right to withdraw from participation in the research and her right to terminate at any time, the anonymity and confidentiality of the responses and voluntary participation were emphasized.A written informed consent was obtained from health care providers (nurses & junior clinicians). No pressure or inducement of any kind wasapplied to encourage all the participants to participate in the research. The identity of individuals from whom information is obtained in the study was kept strictly confidential.

Procedure:

Preparing 3 phases as the following:

- ***The First (Preparatory) phase****:*

- The objective of this session is to equip health care providers (Nurses & clinicians) with the appropriate background concerning cancer cervix and how to diagnose it early.
- In this phase both the nurses and clinicians received a pre-test questionnaire, it included knowledge concerning cancer cervix. followed by receiving 2 sessions in the first week of training, through which the investigator conducted daily training (Sunday to Thursday) for 2 hours to accommodate different healthcare providers schedule in which an overview on the cancer cervix in terms of (causes, risk factors, signs and symptoms of cervical cancer, types, methods of early detection and diagnosis and management) through these sessions an illustrative extensive review of photographs session concerning anatomy and pathophysiology of the cervix, differentiation of normal and abnormal cervices and an illustrative videos to portray how to examine the cervix and applying the acetic acid.

- ***The second phase:***

- The objective of this session is to prepare non-physician clinicians (NPC) such as nurses and junior clinicians on VIA steps to achieve best practice standards in cervical screening by performing the examination safe and reliably.
- The commencement of the clinical trial consisted of 2 weeks (5 days per week) of supervised hands-on clinical examination regarding VIA for early detection of cervical cancer. The conducted training was based on the availability of volunteered cases who came for screening with the aim that both the nurses and clinicians should be able to accurately follow the steps of VIA technique and identify all cases of positive cervical cancer and at least 85% of positive cases query as precancerous lesions correctly, this training based on the training curricula developed by IARC/PATH (Program for Appropriate Technology in Health) and JHPIEGO**(Blumenthal & McIntosh 2005)** in whichVIA was carried out by applying 3-5% diluted solution freshly prepared acetic acid on the cervix with a cotton swab.
- The VIA providers were trained to obtain and document the personal medical history of all the women attending screening.
- At the end of the clinical training session, a post-test questionnaire was disseminated and handed to the participating health care providers (nurses and clinicians) immediately after finishing the training sessions to evaluate their level of knowledge after receiving the 3 weeks training program.

- **The third phase:** In this phase the clinical performance of the screening program was applied on the eligible participated women as the following:

- The examiners (nurse or clinician) follow the learned proper technique of VIA to insert a non-lubricated speculum in the vagina to visualize the cervix.
- The steps of VIA was implemented by applying 3-5% of freshly prepared diluted solution of acetic acid on the cervix with a cotton swab.
- The general information of the participantsand observations of VIA were recorded independently by the nurse and clinician as positive or negative.
- Interpretation of the findings was done after one minute by visualizing the cervix under the illumination of a lamp with 100 watt bulb in which the result delineates VIA positive or negative when the examiners (nurse or clinician) document the result based on IRAC criteria**(Sankaranarayanan et al, 2003)**, the expert at a time assessed each provider separately. It is done based on random schedule of assigned examiner (nurse/clinician) based on their schedule of duties and the availability of patients
- The expert gynecologist (referee) observed all the steps done by nurse/clinicians separately, visualize the cervix and also comment on the cervix after 1 minute of applying the acetic acid then the participants write down the finding either positive or negative in sealed envelope, further the referee put down the graded checklist for each examination in the same envelop for nurses/clinicians, the early detection cancer cervix clinic nurse received two pieces of paper from both the examiner and the reference (expert Gynecologist) without disclosing it and close the envelop.
- Concordance was determined for the diagnosis made by the nurse versus clinicians and the expert Gynecologist.
- All results should be first analyzed and compared to the standard reference to confirm the level of agreement between participants (nurses & clinicians) and the reference standard, then the positive cases referred for colposcopy to be done by the expert gynecologist in this field in order to reduce the risk of overtreatment and proceed according to the result of colposcopy. Further a Biopsy was taken from all abnormal lesions.
- The results of VIA test were classifiedbasedonthe established criteria by the International Agency for Research on Cancer (IARC) **(Sankarnarayanan et al, 2003**). Colposcopic diagnosis was made for positive cases and biopsy results were requested for positive colposcopy to be categorized as different types of cervical cancer (benign, CIN 1, CIN 2, CIN 3 and invasive).

Strengths and limitations of this study:

- Screening of all participants by one simple method (VIA) is considered as the main strength of the present study, moreover all the examiners didn't attend any activities related early cervical cancer detection thus giving the examiners a limited background to score their performance in bias. An expert in the field of gynecology and early cancer detection evaluated the performance of both examiners this in turn limits the possibility of bias between examiners score of examination and reduce the risk of intraobserver variability. Moreover the referee laid down the result based on the observation and give it to the clinic nurse without exposing the result and kept in a sealed envelope to be used as a reference standard for comparing the participants (Nurses & clinicians) results.
- All VIA examination done based on reliable IRAC criteria. **Sankaranarayanan et al (2003)**
- Another strength is that all the Colposcopic evaluation was also performed for all positive cases at the same sitting.
- The main limitation of our study is that the small sample size as more obstacles faced the researcher to collect the examiners due to their busy schedule and time constrains especially clinicians. This limitation avert the research to reflect generalizability of the findings.
- Another limitation of our study is that not all the women who had positive colposcopic result had a biopsy mostly due to non return back of women and more constrains related histopathology laboratory faced the researchers.

Statistical analysis:

Data was coded and analyzed by the researcher using IBM-SPSS (21.0). For descriptive statistics; the researcher used means, standard deviations and percentages. To test the significance: Chi-square test was used to compare the difference in distribution of frequencies among different groups, while McNemar test was used to compare the difference in distribution of frequencies among the same group pre versus post-test. A significant p value was

considered when it is equal or less than 0.05. For continuous variables; independent t-test analysis was carried out to compare the means of normally distributed data, while paired t-test analysis was carried out to compare the means of normally distributed data for the same group pre vs. post-test. Validity statistics (sensitivity, specificity, positive and negative predictive value [PPV & NPV]) were calculated for the accuracy of nurses on the VIA steps of the technique and documenting the results against clinicians. Agreement of results of VIA between nurse and clinician was determined by kappa statistics.

RESULTS

One hundred women were enrolled VIA by the nurse or junior clinician. The mean age of enrolled women was 35 years (range 30-65). Forty percent were illiterate. More than one-third (36%) had basic education and only 24 % of women received higher education. More than half of women lived in rural area (56%) and middle (45%) socio-economic classes. About One-third of them (32.3%) had 5 or more vaginal deliveries. Mean age at first coitus was 18 $\pm$ 3.1 years.

Concerning the knowledge level among nurses and clinicians about causes of cervical cancer, **Table (1)** reveals a significant improvement concerning the mean score level of knowledge related causes and risk factors of cancer cervix before compared to after receiving the program for both nurses and clinicians, however no significant differences were apparent for both concerning knowledge about signs and symptoms of cervical cancer and risk factorseither before or after receiving the program and even by comparing the level of knowledge among nurses versus clinicians.

Figure (1) delineates an improvement of the total percentage of knowledge concerning cancer cervix causes and risk factors among nurses and clinicians especially for the level of poor and good level. A unique improvement in the knowledge of clinicians as they portray 60% excellent improvement in post-test compared to 0% before receiving the program, however, all nurses achieved 0% before and even after receiving the program at excellent level. As regards the comparison between nurses and clinicians accuracy on the VIA steps, **table (2)** reveals total agreement between both groups related some VIA steps in terms of (Drape woman & close curtains, warm and lubricate speculum, insert speculum, open speculum slowly& exposing cervix, apply Acetic acid and wait for 1 m, hold blades open and release screw, Withdraw speculum) with Kappa value (1.000 for all) and good agreement between both are apparent in the following steps (Wash hands & wear gloves, Hold speculum at 45^{o} angle & Documents findings) with a kappa value (0.545,0.667& 0.615 respectively) However, less agreement between both nurses and clinicians concerning the following items of VIA steps (Explain the procedure, ask woman to empty bladder, position the woman appropriately, prepare the equipment, handle instrument in properly, Insert blades vertically, gently slowly into vagina, rotate blades horizontally, tighten screw to hold in open position, comment on cervical findings and interpret the finding after Acetic acid application) with a kappa value (0.400, 0.316, 0.154, 0.000, 0.091, 0.111, 0.364, 0.154, 0.200, 0.412 respectively), the only significant differences between both were in 3 steps hand wash & wear gloves; hold speculum at 45^{0} angle and document the findings).

Table (3) delineates highly sensitivity in the performance of VIA steps among nurses as compared with clinicians in relation to the evaluator (Gynecology expert) with almost concurrent positive predictive value, however the only steps that portray highly needed of nurses to training were only 4 steps (Handle instrument in properly; hold speculum at 45^{o} angle; rotate blades horizontally and comment on cervical findings with a sensitivity value of (62.5%, 25%, 50% & 55.6%) respectively.

T**able (4)** shows a comparison VIA by (nurse and clinician) and the reference test (Colposcopy). The overall accuracy (diagnostic accuracy*) of the screening index (VIA by nurse and clinician) against the reference (Colposcopy) was estimated by the proportion of (TP+TN)/N where N equals the total number of patients being analyzed (N=100). For accuracy the nurse VIA compared to Colposcopy has shown good diagnostic rate 80% and 86% respectively compared to clinician VIA 83%.

Table (1): Effect of Educational Program on the level of knowledge about cancer cervix among nurses versus clinicians

knowledge about cancer cervix	Test	Nurses	Clinicians	P-value*
		Mean + SD		
knowledge related causes of cancer cervix	• Pre-	0.80 ± 0.2	4.00 ± 0.5	**0.001**
	• Post-	4.20 ± 0.4	5.00 ± 0.1	**0.001**
P-value**		**0.001**	**0.002**	
knowledge related risk factors of cervical cancer	• Pre-	4.20 ± 0.8	4.70 ± 1.6	0.379
	• Post-	6.70 ± 0.5	6.60 ± 0.5	0.660
P-value**		**0.001**	**0.004**	
Total Knowledge about cancer cervix causes and risk factors	• Pre-	5.00 ± 1.2	8.70 ± 1.7	**0.001**
	• Post-	10.90 ± 0.3	11.60 ± 0.5	**0.002**
P-value**		**0.001**	**0.001**	
Knowledge about Signs and Symptoms of Cervical cancer	• Pre-	6.90 ± 1.1	7.40 ± 2.1	0.499
	• Post-	6.90 ± 1.1	7.40 ± 2.1	0.499
P-value**		1.000	1.000	

***Independent t-test was used to compare the means among groups**

****Paired t-test was used to compare the means among groups**

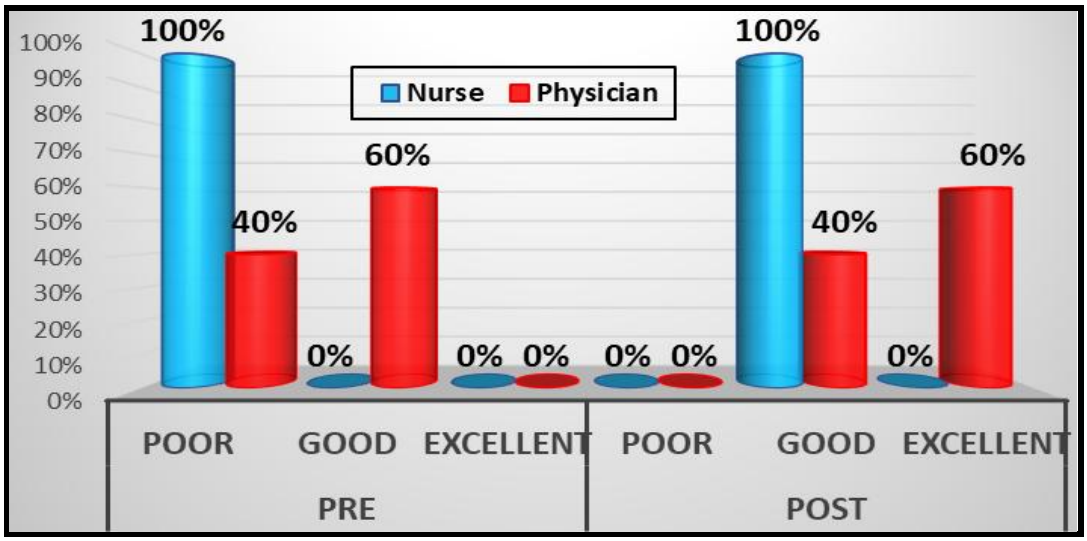

Figure. 1: Effect of educational program on the level of overall knowledge about cancer cervix causes and risk factors among nurses and clinicians

Table (2): Comparison between nurses versus clinicians accuracy on the VIA steps

	Kappa Value	ASE*	95% CI**	Chi-square value	P-value
Wash hands & wear gloves	**0.545**	**0.254**	**0.318-0.751**	**3.750**	**= 0.053**
Explain the procedure	0.400	0.284	0.258-0.594	1.667	= 0.197
Ask woman to empty bladder	0.316	0.152	0.168-0.487	1.071	= 0.301
Drape woman & close curtains	1.000	0.000	-------	------	-----
Position the woman appropriately	0.154	0.112	0.095-0.256	0.278	= 0.598
Prepare the equipment	0.000	-----	------	------	-----
/Handle instrument in properly	0.091	0.288	0.016-0.201	0.104	= 0.747
Warm and lubricate speculum	1.000	0.000	-------	------	-----
Hold speculum at 45° angle	**0.667**	**0.287**	**0.453-0.821**	**6.429**	**= 0.011**
Insert speculum	1.000	0.000	-------	------	-----
Insert blades vertically, gently slowly into vagina	0.111	0.078	0.024-0.301	0.123	= 0.725
Rotate blades horizontally	0.364	0.192	0.188-0.544	1.667	= 0.197
Open speculum slowly, exposing cervix	1.000	0.000	-------	------	-----
Tighten screw to hold in open position	0.154	0.112	0.095-0.256	0.278	= 0.598
Comment on cervical Findings	0.200	0.186	0.118-0.295	1.111	= 0.292
Apply Acetic acid, wait for 2 min.	1.000	0.000	-------	------	-----
Interpret the finding after Acetic acid application	0.412	0.101	0.207-0.651	2.593	= 0.107
Hold blades open and release screw	1.000	0.000	-------	------	-----
Withdraw speculum	1.000	0.000	-------	------	-----
Documents findings	**0.615**	**0.137**	**0.376-0.821**	**4.444**	**= 0.035**

***ASE=Adjusted Standard Error **CI=Confidence Interval**

Table (3): Sensitivity and specificity of accuracy on the VIA steps of cancer cervix for nurses against clinicians

	Sensitivity	Specificity	PPV*	NPV**
Wash hands & wear gloves	**100%**	**50%**	**75%**	**100%**
Explain the procedure	**80%**	**60%**	**66.7%**	**75%**
Ask woman to empty bladder	**71.4%**	**0%**	**62.5%**	**0%**
Drape woman & close curtains	**100%**	**0%**	**100%**	**0%**
Correctly Position woman	**87.5%**	**0%**	**77.8%**	**0%**
Prepare the equipment	**100%**	**0%**	**70%**	**0%**
Handle instrument in properly	**62.5%**	**50%**	**83.3%**	**25%**
Warm and lubricate speculum	**100%**	**0%**	**100%**	**0%**
Hold speculum at 45° angle	**25%**	**0%**	**14.3%**	**0%**
Insert speculum	**100%**	**0%**	**100%**	**0%**
Insert blades vertically, gently slowly into vagina	**88.9%**	**0%**	**88.9%**	**0%**
Rotate blades horizontally	**50%**	**0%**	**66.7%**	**0%**
Open speculum slowly, exposing cervix	**100%**	**0%**	**100%**	**0%**
Tighten screw to hold in open position	**77.8%**	**0%**	**87.5%**	**0%**
Comment on cervical Findings	**55.6%**	**100%**	**100%**	**20%**
Apply Acetic acid, wait for 2 m	**100%**	**0%**	**100%**	**0%**
Interpret the finding after Acetic acid application	**100%**	**33.3%**	**77.8%**	**100%**
Hold blades open and release screw	**100%**	**0%**	**100%**	**0%**
Withdraw speculum	**100%**	**0%**	**100%**	**0%**
Documents findings	**88.9%**	**100%**	**100%**	**50%**

***PPV=Positive Predictive Value ** NPV=Negative Predictive Value**

Table (4): The diagnostic indices of screening tests (Nurse VIA &clinician VIA) in comparison to colposcopy (reference test)

Diagnostic indices	Nurse VIA and colposcopy	Clinician VIA and colposcopy	VIA Nurse and clinician
Sensitivity (%)	92.5	82	73.8
Specificity (%)	65	83	53.4
PPV (%)	63.7	81	50
*NPV (%)	92.8	90	81
Diagnostic accuracy (%)	80	83	86

DISCUSSION

Whereas cervical cancer represents the most common cancer among women in most developing countries and it has a long latent phase, it can be prevented easily by early detection using various screening procedures,one of the most convenient, cost effective method is the use of visual inspection with acetic acid that has been widely assessed for its accuracy for more than a decade. However limited information is available regarding the difference in the test performance between nurses and physicians. As it is well known in developing countries that resource and medical manpower constraints have led to inadequate or no screening **Kathy et al(2006) &Bhavana et al (2010).**This issue inspires the researchers to conduct a training program mainly to equip both nurses and junior clinicians by essential knowledge related cancer cervix and train them on VIA procedure to promote effectiveness of VIA.

An important aspect of the present study was that both the nurses and the junior clinicians (novice health-care staff) underwent the same training under supervision before launching of the study and both of them didn't attend any cervical cancer screening program before enrollment in the study or being included in such examination independently for that an expert in Gynecology field train and evaluate their VIA steps(**Kelly et al 2011).**

Unlike other early cervical cancer detection screening by medical and paramedical health care providers, the present study put great emphasis on equipping the health care providers (nurses and clinicians) with a background knowledge (as a fist concern in the present study) concerning cervical cancer which is found globally acceptable although gaps persist concerning knowledge on certain risk factors of cervical cancer. The rationale behind assessing and giving this information was emphasized that those health-care providers who are not fully informed about cervical cancer, they will not provide sufficient information regarding cervical cancer screening for women who attend health-care facilities. **Hweissa et al (2016).**

In the same line, **WHO (2019)** emphasized that raising awareness of health care providers (physicians, nurses and other health care providers) as well as the general publicaboutpossible warning signs of cancer, can have a great influence on the disease. In this respect, the findings of the present study highlighted a significant improvement of nurses and clinicians knowledge as compared between pre and post program in respect to causes and risk factors of cervical cancer. However no significant differences were apparent concerning knowledge about signs and symptoms of cervical cancer and even by comparing the level of knowledge among nurses to clinicians, which reflected being more knowledgeable about the signs and symptoms rather than causes and risk factors. This finding may explain the assumption emphasized in the study done by **Di et al (2016)** in which they stressed the requirement of health-care providers for educational and awareness campaigns towards cervical cancer before embarking in the screening which will in turn improve the screening attendance and offer a precious advice regarding the screening.

The second concern of the present study highlighted the effect of the intensive training program on the performance of VIA steps based on applied checklist both nurses and junior clinicians trained on its steps by an expert in the Gynecology field, the findings delineated an agreement between nurses and clinicians performance. This agreement varied between total and good agreement between both groups related most VIA steps with a kappa value (ranged between 0.667 to 1.00), however the only steps that portray highly needed of nurses to training were only 4 steps (handle instrument in properly, hold speculum at 45^{o} angle, rotate blades horizontally & comment on cervical findings with a sensitivity value of 62.5%, 25%, 50% & 55.6% respectively) but with no significant difference between both health care providers. This finding reflected that approximately one-quarter(25%) of nurses need more training to rely independently on their performance. The findings of the present study highlighted the gaps and deficiencies concerning these steps that will encourage the upcoming training program to be more effective by addressing these specific issues and add great emphasis on the training of nurses regarding the cervical findings. In this respect also**Raifu et al (2017)** who studieddeterminants of cervical cancer screening accuracy for VIA and VILI performed by nurse and physician,foundit sensible that nurses need more training on case definition and interpretation of definite aceto-white cervical epithelium of VIA test. This study proved our finding in which nurses still need more training on how to interpret the results accurately to decrease the number of false positive results.

In contrast, **Selmouniet al (2016)** who studiedprovider skills in performing visual inspection with acetic acid in the cervical cancer screening program found differences between provider profiles in which midwives/nurses perform the VIA test regularly and are therefore more successful in performing VIA than general practitioners (GPs)which could be attributed to the lack of involvement of GPs in the program.

Moreover, inadequacies in some of key steps of VIA technique was observed also by **Selmouniet al (2016)** in which all recommended preparatory steps for VIA were performed correctly in only 15% of procedures, and in 10% of the procedures, diluted 3-5% acetic acid was not prepared as per the guidelines.

Concerning the evidence based practice of measuring the accuracy of detecting cervical cancer by using VIA, it has been expanded significantly over the past few years and proved that it has sensitivity comparable to or greater than that of cytology. In this respect, **Almonte et al (2007)** emphasized that when professionals (physicians and midlevel providers) are properly trained and supervised during using VIA, thesensitivity has ranged from 41% to 79%. Similarly, the present studydisplayeda comparison of VIA by (nurse and clinician) and the reference test (Colposcopy) for accuracy, the nurse VIA compared to colposcopy (80% and 86% respectively) has shown good diagnostic rate and be comparable to that done by clinician VIAto colposcopy(83% and 86% respectively). So the nurses' accuracy level were within range and their results were acceptable and equivalent to clinicians.

In the same line, **Sherigar et al (2010)**found that well trained nurse can be an effective alternative human resource replacing physician in cervical cancer screening using VIA. In this respect their study delineated that VIA by physician versus nurses had a higher sensitivity (88.9% versus 80.0%) and a higher specificity (69.8% versus 54.9%) with a disease threshold of CIN 2 and above. The concordance of results showed moderate agreement (kappa=0.366).

Althoughseveral studies revealed that VIA performed by both physician and nurse were comparable, **Arbyn et al (2006)** study revealed a better sensitivity and specificity by physician compared to the nurse. On the other hand, **Bhatla et al (2004)** reported that the sensitivity of VIA by nurse (100%) was found to be better than physician (88%) but the specificity by physician (63%) was superior to that by nurse (53%) in their study. Similarly**Ghislain et al (2006)** findings accomplished in a primary health care setting in Africa reported that the sensitivity by physician & nurse were 71% & 55% & specificity was 71% & 65% respectively.

Moreover, the findings of the present study reflected that the false positive predictive value was barely higher amongnurses compared to clinicians' value (63.7, 81 respectively).
This finding may be attributed to the subjective nature of the test and the nurses still need more emphasis on how can accurately interpret the result of applying acetic acid however, the probability that the result of the test was really negative was more evident among nurses compared to clinicians (92.8 & 90 respectively). This finding was harmonized with **Bhatla et al (2004)** whoobserved that the physician was aware with gynecological examination and several pathological conditions of cervix to certain non-significant difference than the nurse which had been reflected the fact that VIAis provider dependent which urge health institution for intensive training with periodic reinforcement that is considered essential for providers who have limited knowledge regarding cervical pathology.

To highlight theprevious studies, Alliance for cervical cancer prevention (ACCP) & Global guidance for cervical cancer prevention by FIGO recommended that the cervical cancer screening can rely on VIA used by nurses, midwives, paramedical personnel and local physicians which could achieve effective result until HPV DNA tests become available and reasonably priced.**(Alliance for cervical cancer prevention, 2009), (International Federation of Gynecology & Obstetrics, 2009)**.

To sum up, **Blumenthala et al (2005)** shade the light on principles of successful and comprehensive VIA trainingfor health care providers, as they highlighted two significant issues in term of basic purpose and the details of the procedurethat signifies the didactic elements whichmanage both of these issues and sets the training into anapplied perspective this in turn will let trainees achieve a wider appreciation for cervical cancer prevention efforts and a profounder insight into the important role such efforts play in disease prevention. This insight highlighted and proved our assumption concerning this issue.

CONCLUSION

The findings of the present study delineated effective VIA as a screening test using stringent criteria. Nurses had reasonable knowledge concerning cervical cancer as well as junior clinicians and with proper training the nurses can perform these tests with acceptable accuracy regarding most steps of VIA with high sensitivity, however intensive training and periodic reinforcement sessions are needed to slightly limit the false positive predictive value among nurses.

RECOMMENDATIONS

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

- Conducting in-service training program for nurses who are giving care to gynecologic patients to overcome the problem of busy clinician schedule and to increase the screening services with highly equipped nurses.
- Asupportiveguiding plan should be drawn up not only to identify deficiencies of healthcare providers' performance but also to provide guidance and training to correct them.
- Efforts should be directed on the institutional level to implement a fresh incentive to further expand and provide VIA services to health facilities across the low limited resources as Upper Egypt region.
- More researches are needed to compare the VIA provider's performance according to the factors as age, years of experience and residence of the providers.
- A qualitative approach research is highly needed to study in depth and gain insight into the health needs of the population through conducting outreaches activities and special surveys and communication support materials including (posters, flyers, counselling flipcharts, information booklets) within these areas.

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