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Research Article

Comparison Between Pap Smear and Visual Inspection by Acetic Acid as Screening Tests for Cervical Cancer in Sudan August 2020

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Abstract

Background: The invasive cancer of the cervix is one of the most common cancers among women in Sudan.

Objective: To compare cervical cytology (Pap smear) with visual inspection of acetic acid (VIA), as screening assessments for the prevention of cervical cancer in Sudan, as well as the sensitivity, specificity, PPV and NPV of the two screening techniques. A hit screening wishes appropriate methods which provide correct effects. In many evolved countries, Pap smear has validated to be successful, at the same time as suggestion with acetic acid (VIA) is a success in growing countries because of its simplicity and value effectiveness.

Methods: It is a cross section descriptive study, performed among one hundred healthy females in 7 governmental hospitals in Sudan within the duration of February to July 2020. Samples were taken during gynecological speculum examination. Pap smears were taken from the cervix first and sent for cytology, then the acetic acid 5% applied at the cervix to study the changes in color (acetowhite which is positive). Then all effective instances from each screening strategy have been conducted to colposcopy as a confirmatory tool. Estimation of sensitivity, specificity, effective predictive and poor predictive values have been calculated with the aid of the use of well-known statistical components.

Result: Out of a hundred ladies collaborating on this study 21 (21%) have been discovered to be positive cases in both assessments; out of these 21, 10 cases positive samples have been detected by means of VIA and 11 samples were detected by Pap smear. Then all high-quality (positive) cases had been subjected to colposcopy. The consequences showed 7 samples out of 10 from VIA whilst handiest three high quality samples out of 11 from Pap smear.

The sensitivity of VIA and Pap smear had been 70% and 30%, while the specificity have been 72.7% and 27.3% respectively.

Our outcomes confirmed the effectiveness of VIA as a screening approach in Sudan.

Conclusion: In the developing nations, VIA is a powerful approach to gain fairly correct and reproducible outcomes in detecting cervical cancer.

Keywords: *Pap Smear; Visual Inspection; Acetic Acid; Screening Tests; Cervical Cancer*

Introduction

Worldwide, invasive cervical cancer is the second common gynecological malignancy after endometrial cancer but in Sudan cervical cancer is number one gynecological cancer and the fourth common malignancy in women. According to the latest information, an expected 466,000 new cases of cervical cancer arise among women internationally each 12 months, and the great majority of them are from growing countries. Of the 231,000 girls who die of cervical cancer annually, 80% are from growing nations, in which cervical malignancy is the most common cancer. The incidence of cervical cancer most common in Central America and Sub-Saharan Africa that is due to lack of effective screening for HPV and failure to detect early precancerous cervical changes. Global occurrence and mortality rate are even extra numerous. There has been approximately 75 percent decrease in advanced nations. In comparison steady rising in growing countries. In 2002, in growing countries, 493,243 new cases have been observed and 273,606 deaths, corresponding to 55 percent mortality rate.

This discrepancy is basically because of the enormous steps in cervical cancer prevention application in advanced nations, which are basically non-existent in many developing countries. Based on a recent meta-evaluation of process of care disasters inside the prevention of cervical cancer, poor screening data turn out to be the primary issue: 54 percent of invasive cervical cancers patients had inadequate screening history and 42 percent had been in no way screened. In addition, whilst cervical cytology exams are exquisite screening for pre-invasive ailment, the fake bad fee for sufferers with invasive most cancers are rather excessive: eleven to 33 percent in a series of Northern European and US research. Thus, a negative cervical cytology smear can't be relied upon to exclude disorder in a patient with symptoms or signs and symptoms of cervical cancers.

Justifications

Even though cervical cancer is one of the leading killing diseases taking the lives of our women and destroying families, it is preventable. But there is a lack of well-established screening programs; there is a lack of trained cytotechnologists, cytology laboratories in addition to limited resources to establish an effective cytology screening program, that is besides the existence of other very pressing health needs. The screening of cervical cancer in Sudan through Pap smear test, which is known to be highly sensitive and specific, is limited to few special clinics. Visual inspection with acetic acid (VIA) has verified high sensitivity for detecting CIN and cervical cancer specifically in developing countries.

Objectives of the Study

General objective:

- To compare cervical cytology (Pap smear) with visual inspection with acetic acid (VIA) as screening tool for prevention of cervical cancer in the study area.

Specific objectives:

- To compare sensitivity and specificity of cytology test with VIA.
- To study positive and negative predictive value of cytology and VIA.

Literature Review

Incidence

The incidence of invasive cervical cancers is associated with a mean age of forty-seven years at diagnosis within the United Stated. From 1995 to 1999, the USA incidence of cervical cancer in women below age 20 is mentioned to be 0/100/12 months, growing to

1.7/100/year in women elderly 20 to 24 years and peaking at 16. 5/100,000/yr. in girls elderly forty-five to forty-nine years. Only 10 percent of instances arise in women aged seventy-five or older. The probability of growing cervical cancer by way of age is: 1 in 638 for ladies aged 39 years and more youthful; 1 in 359 for ladies aged forty to 59 years; 1 in 750 for women 60 to sixty-nine years; and 1 in 523 for women aged 70 years and older; with a life-time probability of one in 142 [1].

Epidemiology and risk factors

Cervical intraepithelial neoplasia (CIN), adenocarcinoma, and squamous cell cancer of the cervix share many of the same risk factors. They include early onset of sexual activity, more than one sexual partner, a high-danger sexual accomplice (e.g. promiscuous sexual activity, sexual publicity to a associate with human papillomavirus infection), records of sexually transmitted ailment (e.g. *Chlamydia trachomatis*, herpes simplex virus), smoking, high parity, immunosuppression, low socioeconomic status, prolonged use of oral contraceptives and previous records of vulvar or vaginal squamous dysplasia. In assessment to squamous mobile most cancers of the cervix, cigarette smoking isn't related to an extended risk of adenocarcinoma of the cervix compared to nonsmokers RR of squamous cell carcinoma in people who smoke 1.50, 95% CI 1.35 - 1.66, RR of adenocarcinoma in smokers 0.86, 95% CI 0.70 - 1.05) [8].

A collaborative re-evaluation of information from 24 epidemiological research observed that, among cutting-edge customers of oral contraceptives, the chance of invasive cervical most cancers elevated with growing duration of use (RR 1.90 [≥ 5 years' use versus never-use], 95% CI 1.69 - 2.13). The risk declined after use ceased, and by 10 or more years, had returned to that of never users. In the same study, use of oral contraceptives for 10 years from age 20 to 30 years was estimated to increase the cumulative incidence of invasive cervical cancer by age 50 from 7.3 to 8.3 per 1000 in developing countries and from 3.8 to 4.5 per 1000 in developed countries.

In America, the incidence of cervical cancer is 50 percentage better in African American compared to white women, and sixty-six percentage higher in Hispanic as compared to non-Hispanic ladies. Circumcised men have a lower threat of penile HPV infection and, in people with a history of more than one partners, a discounted risk of cervical most cancers of their modern-day companions.

Adenocarcinomas, which encompass mucinous, endometriosis, clean cellular, and serous kinds, were growing in incidence since Nineteen Seventies, especially in ladies more youthful than 35 years of age. Part of the increase may be resulting from an increasing incidence of HPV infection and part to enhancements in screening and prevention of squamous intraepithelial neoplasia, accordingly mainly to a histologic shift towards adenocarcinoma.

While some studies recommend that adenocarcinoma appears to have a more potent affiliation with oral contraceptives than does squamous mobile cancer, others observed a similar danger growth with growing duration of oral contraceptives for both adenocarcinoma and squamous cellular carcinomas.

Histopathology

The histopathologic types of cervical cancer based on SEER data, in the US squamous cell carcinomas (SCCs) account for approximately 70 percent of cervical cancers, adenocarcinomas 25 percent and adenosquamous carcinomas 3 to 5 percent. Aden squamous tumors exhibit both glandular and squamous differentiation. They may be associated with a poorer outcome than SCCs or adenocarcinomas. In addition, neuroendocrine or small cell carcinomas can originate in the cervix in women but are infrequent. Rhabdomyosarcoma of the cervix is rare; it occurs in adolescents and young women.

Primary cervical lymphoma and cervical sarcoma are also rare.

In poorly screened populations, most of the cervical cancer are of squamous history, whereas in populations with good cervical cancer screening programs, the population adenocarcinoma is increased. This is thought to be due to the worse performance of screening techniques for the detection and recognition of glandular precursor lesions.

A study of the Pap screening history of women with squamous cell versus adenocarcinomas revealed that women with adenocarcinoma had significantly more recent false negative Pap test results and a significantly shorter time between the preceding negative Pap test and cancer diagnosis. The International Collaboration of Epidemiological Studies of Cervical Cancer analyzed data from 12 epidemiological studies and found that screening reduced the risk of both histological subtypes, but much more so for squamous cell carcinoma (RR 0.46, 95% CI 0.42 - 0.50) than adenocarcinoma (RR 0.68, 95% CI 0.56 - 0.82).

Clinical manifestations

Early cervical cancer is frequently asymptomatic, underscoring the importance of screening. The most common symptoms at present are:

- Abnormal vaginal bleeding
- Postictal bleeding
- Vaginal discharge that may be water, mucoid, or purulent and malodorous.

The vaginal discharge may be improper for severe cervicitis, especially if the lady is young and the cervical cytology smear indicates intense infection, that is a common locating in overt malignancy. Pelvic or lower backache, which might also radiate alongside the posterior facet of the lower extremities, can arise with superior disease. Bowel or urinary symptoms, along with pressure-associated proceedings, hematuria, hematochezia, or vaginal passage of urine or stool, are uncommon and suggest superior disorder.

Cervical examination

Most women with invasive cervical cancer have a seen cervical lesion; but its presence can range from an ordinary acting cervix with an remoted odd cervical cytology (Papanicolaou) smear, to a grossly strange cervix this is replaced completely with tumor.

Cervical cancer usually originates at the transformation zone, a dynamic area between the original and present squamocolumnar junction. The lesion may manifest as superficial ulceration, exophytic tumor in the exocervix, or infiltration of the endocervix. Endophytic tumors can result in an enlarged, indurated cervix whose surface is smooth (barrel shaped cervix). Among cervical adenocarcinomas, about one-half of are exophytic, others diffusely extend or ulcerate the cervix, and approximately 15 percent don't have any seen lesion due to the fact the carcinoma is inside the endocervical canal.

Routes of spread

Cervical cancer can unfold via direct extension into the uterine corpus, vagina, parametria, peritoneal hollow space, bladder, or rectum and through lymphatic or hematogenous dissemination.

It became formerly thought that the obturator lymph nodes had been maximum regularly concerned, and that lymphatic spread superior in an orderly fashion from the lymph nodes on the pelvic sidewall to the common iliac, after which the paraaortic group. However, next studies using the sentinel lymph node mapping method emphasize that any of the pelvic lymph node groups, and even paraaortic lymph nodes, may comprise the first draining lymph node and may be the first website online of metastasis.

Diagnosis:

- In women with a grossly visible lesion, a suspected diagnosis of cancer must be confirmed by punch biopsy of the lesion (at the edge of the tumor).

- Symptomatic women without a visible lesion and those who have only abnormal cervical cytology should undergo colposcopy with directed biopsy. An adequate colposcopy requires that the entire squamocolumnar junction and all lesions be completely visualized and that biopsies of the lesions explain the abnormal cytology.

- Conization is necessary if colposcopy is inadequate and for diagnosis of microinvasive disease (stage IA, no clinically visible lesion) because maximum depth of invasion can only be determined by examination of the entire lesion. Either cold knife conization or loop electrosurgical excision is acceptable. Cervical conization can be an adequate therapy of stage IA1 disease and is preferable to loop electrosurgical excision because there is no thermal artifact which can obscure interpretation of the status of the surgical margins.

- Any cervix that is unusually firm or expanded should be sampled by punch biopsy and endocervical curettage, even if the cervical cytology test does not show evidence of neoplasia.

Differential diagnosis

Benign tumor-like lesions that may mimic carcinoma include nabothian cysts, glandular hyperplasia, glandular changes from inflammation, and endometriosis.

The completion of the initial staging evaluation requires chest radiograph, intravenous pyelogram (IVP), complete blood count, renal and liver function tests, and, in suspected advanced disease, cystoscopy and/or proctosigmoidoscopy.

Prevention of cervical cancer

Primary prevention

Two vaccines are presently to be had that shield in opposition to a few varieties of HPV. The first vaccine (Gadasil®) protects against type 6 and type 11, which cause the most instances of genital warts and in opposition to kind 16 and type 18, which reason the most instances of cervical cancer. The different vaccine (Cervarix®) protects towards type sixteen and kind 18. The vaccines cause the immune machine to fight off these types of HPV if a person is exposed to them. They do not defend in opposition to other sorts of HPV [5].

Routine HPV vaccination is suggested for females' elderly 11 to 12 years. Females as younger as age nine years might also acquire HPV vaccination. HPV vaccination is likewise advocated for girls' elderly thirteen to 18 years to trap up overlooked vaccine or complete the vaccination series.

There are currently insufficient statistics to propose for or in opposition to conventional vaccination of women aged 19 to 26 years within the popular populace. A decision approximately whether a lady aged 19 to 26 years should get hold of the vaccine must be primarily based on a knowledgeable discussion between the girl and her health care provider concerning her threat of preceding HPV publicity and potential benefit from vaccination.

Ideally the vaccine has to be administered prior to potential exposure to genital HPV via sexual intercourse because the ability gain is possibly to decrease with growing number of lifetime sexual companions. HPV vaccination isn't always presently encouraged for ladies aged 26 years or for males. Screening for cervical intraepithelial neoplasia and cancer need to maintain in each vaccinated and unvaccinated girls in keeping with current ACS early detection guidelines.

Secondary prevention

Cervical cytological testing

Pap smear screening: Important but imperfect

The results of habitual Pap smear screening inside the industrialized world were incredible, and the procedure has contributed to the 70% to 80% discount of cervical most cancers. For instance, inside the United States, wherein a typical decline inside the wide variety of cervical most cancers cases have passed off, charges although continue to be high in impoverished areas.

The technique entails gently scraping cells from the cervix onto a glass slide and sending it to a laboratory in which technicians had been educated to research cell structure. Results of the evaluation normally are communicated to ladies within numerous weeks (although in lots of settings it takes longer or women by no means acquire their effects). Women with low-grade abnormalities are informed to return for periodic follow-up smears. For women with severe abnormalities, clinicians may additionally have a look at the cervix with a unique magnifying scope called a colposcope, achieve a tissue sample so a prognosis can be made, and then cast off or destroy ordinary tissue on the cervix.

Although Pap smear screening is used in many growing nations, the technique has had confined fulfillment. The minimum requirements for setting up a powerful Pap smear screening attempt include:

- Well-trained providers, nurses, midwives, and physicians' assistants.
- Examination rooms and laboratories stocked with the necessary supplies and equipment.
- Linkages, including transportation, to reliable laboratories with appropriately trained technicians.
- Strategies for ensuring the quality of Pap smear samples and the accuracy of interpreting them.
- Proven systems for timely communication of Pap smear results to screened women, and effective referral and follow-up systems for diagnosis and treatment of abnormalities.
- (It needs: Qualified provider, examination room, linkages, strategies and proven system).

A new method for preparing cervical samples obtained by special brush (technique is similar to Pap smear) for cytological examination is the production of a thin layer of cervical cells on a microscope slide, suitable for diagnosis of cytological abnormalities. The sample is either centrifuged to produce a cell pellet or drawn through a filter under negative pressure to collect cells. The resulting cell sample is fixed onto a glass slide and stained by the Papanicolaou staining method for examination under a microscope. Even though it reduces the number of false negative cases, it's very costly and difficult to be applied in developing countries.

Visual inspection

In regions where Pap smear screening isn't available or less costly, different techniques of checking out have been evaluated.

Visual inspection of the cervix, the use of acetic acid (VIA) or Lugol's iodine (VILI) to highlight precancerous lesions in order that they can be regarded with the 'naked eye', shifts the identity of precancer from the laboratory to the medical institution. Such approaches put off the need for laboratories and delivery of specimens, require little or no system and provide patients with instantaneous test results. A variety of medical professionals-doctors, nurses, or expert midwives-can successfully perform the system, furnished they get hold of

adequate training and supervision. As a screening test, VIA may additionally perform as well as or better than cervical cytology in accurately figuring out pre-cancerous lesions. This has been validated in diverse research in which educated physicians and mid-level providers effectively diagnosed between 45% and 79% of ladies at high chance of developing cervical cancer. By comparison, the sensitivity of cytology has been proven to be between 47 and 62%. Cytology presents better specificity (fewer fake positives) than VIA. Like cytology, one of the barriers of VIA is that consequences are quite dependent on the accuracy of a person's interpretation. This means that initial training and on-going best management are of paramount importance. Increased false positives are especially essential in a display screen-and-treat setting, on the grounds that over-treatment and ensuing impairment of fertility is more likely.

VIA can provide big advantaged over Pap in low-useful resource settings, specifically in phrases of increased screening coverage, improved observe-up care and usual application nice. Due to the need for fewer specialized employees and much less infrastructure, education, and device, with VIA public fitness systems can provide cervical cancer screening in more far off (and less geared up) health care settings and may obtain better insurance. Furthermore, carriers can proportion the consequences of VIA with patients without delay, making it possible to display screen and deal with women at some stage in the identical go to. This allows ensure that follow-up care can be furnished immediately and decreases the quantity of ladies who may additionally leave out on remedy because they are now not able to return to the clinic at once more. In a 'display screen and treat' assignment in Peru, for instance, simplest 9% of girls who screened effective failed to obtain treatment inside the unmarried-visit method, compared with 45% of women who have been misplaced to remedy the use of a multi-go to mode.

The visible exam of the cervix of asymptomatic ladies with the intention to stumble on cancer at an early level isn't always predicted to lower the occurrence of invasive cancer, but it might decrease mortality via early detection. It has been shown that it's far more possible to detect about 50% of cervical cancers at an early stage (degree zero-IIa) through visible screening.

VIA has successfully been paired with cryotherapy, an enormously simple and less expensive method of treating cervical lesions that can be executed by using primary care physicians and mid-degree vendors VIA is considered an appropriate mode of screening with the aid of women. In a examine performed in India determined that maximum ladies reported no pain or simplest moderate pain throughout screening (94.2%). The most commonplace complaint after screening became vaginal discharge (12%). A burning sensation in the vaginal changed into skilled by means of a number of the women (8%). Those lawsuits have been moderate and brief-lasting in the majority of cases. Most of the women were satisfied with the screening carrier (94.6% decided on the top 3 of a six-factor response scale) and 97% stated they would advise the test to others. The maximum not unusual motives for dissatisfaction with screening had been pain at some stage in or after screening, lengthy ready time and failure to get remedy for other clinical troubles.

HPV DNA testing

New tests can stumble on DNA from excessive risk HPV kinds in vaginal or cervical smears. A pattern of cells is accrued from the cervix or vagina the use of a small brush or swab; then, the specimen is dispatched to a laboratory for processing.

One advantage of HPV DNA testing is that after situations are best, it is not as subjective as visual and cytologic screening. It can perceive ladies who already have cervical disease similarly to folks who are at accelerated chance for developing it. HPV DNA testing is specifically valuable in detecting excessive-grade precancerous lesions in ladies over age 25 because HPV infections in ladies underneath 30 are probably too temporary.

The hybrid capture®2 test (hc2)

The hc2 test can detect 13 types of HPV and is more sensitive than visual inspection methods and cytology, but it is expensive and presents some of the same challenges as cytologic screening in low-resource areas. For example, the test requires laboratory facilities, special equipment, and trained personnel; takes six to eight hours for results; and requires follow-up visits for results and treatment.

The fast HPV test

The fast HPV test is being developed specifically for use in low-resource settings. This test will be able to detect DNA from 14 high-risk types of HPV, and test results are available in two or two and a half hours [6].

Colposcopy

Colposcopy has turn out to be diagnosed as a confirmatory take a look at for cervical most cancers, not painful, has no side effect and secure even for pregnant ladies. The basic concepts of colposcopy include low-power magnification and illumination of the uterine cervix, later on, came the advent of the inexperienced filter out to enhance vascular appearances at the time of colposcopic evaluation.

The objectives of colposcopic evaluation are to check abnormalities detected on cervical smear, to verify diagnosis by way of colposcopic-directed biopsies, to rule out invasive ailment, to useful resource in outpatient control of pre-cancerous lesions and comply with-up after treatment.

Colposcopic evaluation continues to be subjective, and know-how on this approach is gained via a length of apprenticeship. This therefore leads to observer variability. The interobserver variability among experienced colposcopists exhibits lower stages of settlement for diagnosing low-grade lesions than for excessive-grade lesions. The equal ranges of agreement were determined amongst pathologists for the histopathological diagnosis of cervical lesions.

Methodology

Study design

This is a cross sectional descriptive study of cervical screening using Pap smear and VIA as screening methods.

Study period

From February to July 2020.

Study area

This study was carried out in the Sudan. The study area consists of a group of governmental hospitals include Khartoum teaching hospital, Elshaab hospital, Atbara teaching hospital, Kassala teaching hospital and port-Sudan teaching hospital and wad-Madani teaching hospital, and Algadaref teaching hospital.

Study population

All women who arrived at government teaching hospitals with symptoms of cervical cancer in the study area were recruited for screening together with other women relatives.

Sample collection

Health Education Campaign in the form of leaflets, brochures and posters including the disease and its complication, in addition to how it can be detected were distributed to the targeted population explaining the disease and treatment in early stages.

When a lady visited the clinic, verbal and written consent were taken from her and answering her question.

The test was done by trained personnel and the results were documented in a specially designed questionnaire.

Methodology

The site for the testing is at KTH department of Obs and Gyn special clinic in the department, training session for collection of sample and preparation of smear were conducted prior to study this involved also skilled training of personal on speculum examination as well as counselling of patients, preparation of the smear and cyto-technician.

Positive tests were confirmed by colposcopy in KTH cervical pathology and colposcopy unit.

Positive cases were treated as protocol according to severity and all the positive cases will be followed up according to the protocol. Cytology samples will be collected using the Aylesbury spatula. The sample will be smeared to glass slides and hydrated in 95% alcohol for 2 minutes and 70% alcohol for 2 minutes, then rinsed in water for 1 minute, after that it was stained in Harris' hematoxylin for 5 minutes and again rinsed in water for 2 minutes, then it was differentiated in 0.5% aqueous hydrochloric acid for 10 seconds approximately and will be rinsed in 2 water for 2 minutes, then it was blued in Scot's tap water substitute for 2 minutes and rinsed in water for 2 minutes, after that dehydration was done using 70% alcohol for 2 minutes then 95% alcohol for 2 minutes, and then stained in OG 6 for 2 minutes, and rinsed in 95% alcohol for 2 minutes also. Then stained in EA 50 for 3 minutes and rinsed in 95% alcohol for 1 minute and examined microscopically and all abnormal cases were sent for colposcopy.

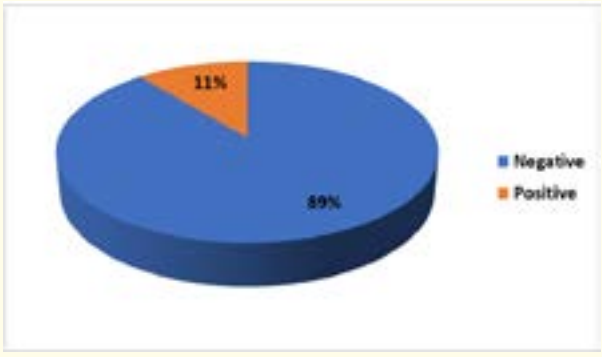

Figure 1: *Percentage of positive and negative Pap smear cases among the studied population.*

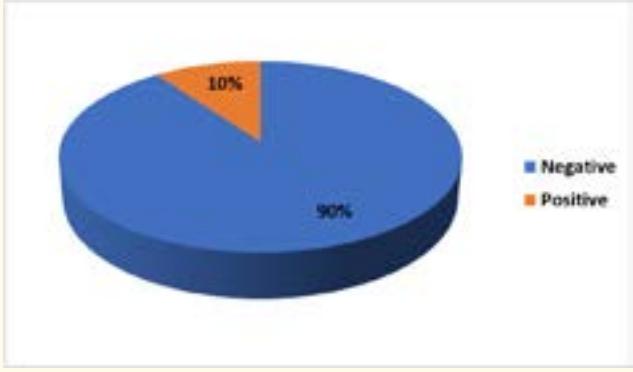

Figure 2: *Percentage of VIA positive and negative cases among studied population.*

Results

The demographic background of the studied population ranged between 30 to more than 50 individuals. More than half of the studied population aged between 30 to 39 years. About one third were 40 - 49. The remaining group were more than 50-years-old (Figure 3). 31% of the screened ladies were university graduates, 29% were Secondary school graduates. 25% were ladies with elementary schooling and 15% were illiterate women.

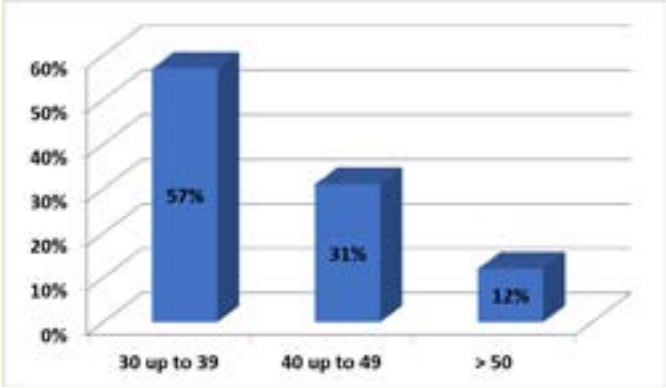

Figure 3: *Distribution of women subjected to cervical cancer screening according to age group.*

Almost all the studied population were not screened before, except 3% (Figure 4).

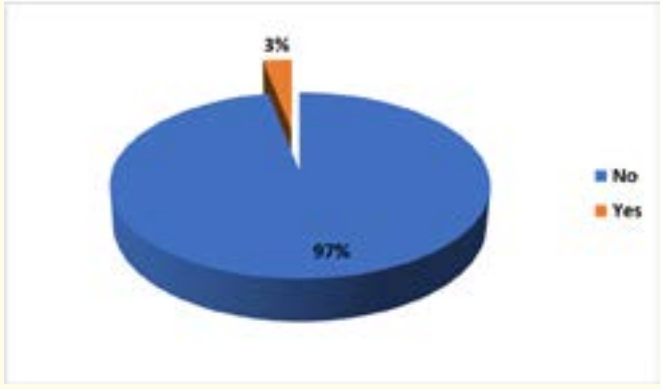

Figure 4: *Percentage of previously screened studied population.*

Forty five percent of the screened women had 3 - 5 children, about quarter had 1 - 2 children and 20% had more than 5 children. The nulliparous were 12% of the studied population (Figure 5).

Only 7% of the studied women had married more than once and the majority were monogamy (Figure 6).

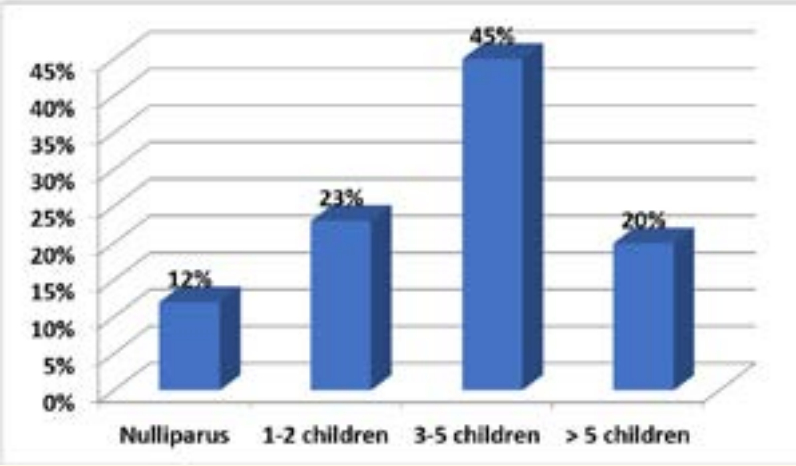

Figure 5: *Percentage of parity among studied population.*

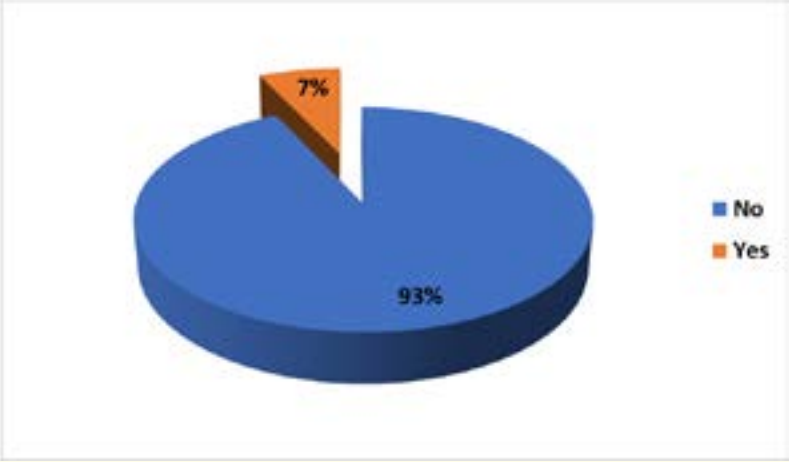

Figure 6: *Percentage of polygamous among studied population.*

One third of the studied women were using contraceptives, two thirds of the screened samples (65%) didn't use oral contraception pills (Figure 7). Most of the women were not screened for HIV but 6% were screened and they were negative (Figure 8).

Ninety one percent of the studied samples were circumcised, and the rest were not (Figure 9).

One hundred women were subjected to cervical cancer screening, 21 were found to be positive for both tests: 11 positive cases for Pap smear and 10 cases for VIA. The results of the two methods underwent exchanged tests; there was agreement between the two methods in 3 positive results. Also, the 21 positive samples were subjected to colposcopy. Regarding Pap smear test group, three out of eleven were

confirmed positive after the colposcopy, i.e. 27.3% were positive, and 8 (72.7%) were negative. Regarding VIA test group, seven out of the 10 positive samples were confirmed positive (70%) by colposcopy and three were negative (30%) (Table 1).

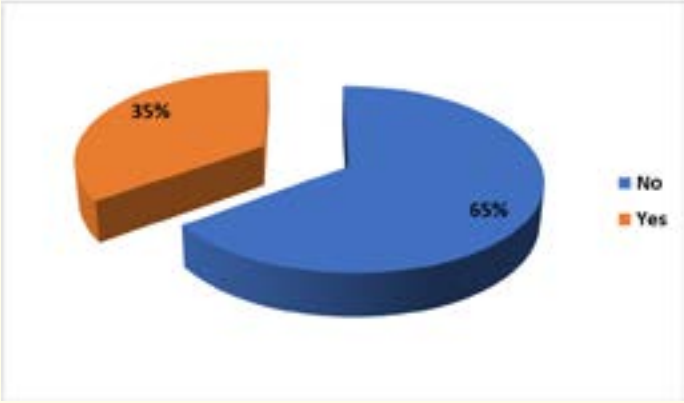

Figure 7: *Percentage of usage of contraceptive pills among studied women of cervical screening.*

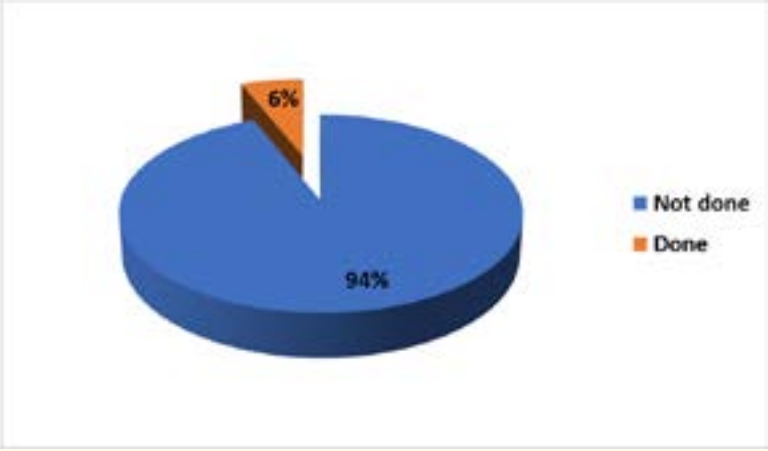

Figure 8: *Percentage of HIV screened cases among subjected to cervical cancer screening.*

Results of colposcopy	Pap Smear		VIA Test	
	Freq.	%	Freq.	%
Positive	3	27.3%	7	70%
Negative	8	72.7%	3	30%
Total	11	100	10	100

Table 1: *Results of confirmatory test (colposcopy) results of Pap smear and VIA test for women subjected to cervical cancer screening.*

Positive and negative predictive values of Pap smear test were found to be 30% and 27.3% respectively, while parallel values for VIA test were 70% and 72.7% respectively (Table 2 and 3).

Sensitivity/Specificity	Pap Smear	VIA Test
Sensitivity	30%	70%
Specificity	27.3%	72.7%

Table 2: *Calculations of sensitivity and specificity values among women subjected to cervical cancer test by VIA, Pap Smear methods, according to colposcopy results as reference.*

PPV/NPV	Pap Smear	VIA Test
Positive predictive value	30%	70%
Negative predictive value	27.3%	72.7%

Table 3: *Calculations of PPV and NPV among women subjected to cervical cancer test by VIA, Pap smear methods, according to colposcopy results as reference.*

Regarding Pap smear test, 95% accepted the test, 3% didn't accept it, while 2% did not know, similar values for VIA test were 96%, 3% and 1% respectively. Almost 40% of the screened population found the test painless and the same percentage felt discomfort during the process. Some of the studied samples suffered pain but the minority could not specify their feeling (Table 4).

Acceptability	Pap Smear		VIA Test	
	Freq.	%	Freq.	%
Accepted	95	95	96	96
Not Accepted	3	3	3	3
Do not know	2	2	1	1

Table 4: *Acceptance of VIA among women subjected to cervical cancer screening.*

		Result of colposcopy		Total
		Negative	Positive	
VIA results	Negative	11		11
	Positive	3	7	10
Total		14	7	21

Table 5: *P value significant 0.001.*

			Result of colposcopy		Total
			Negative	Positive	
VIA results	Negative	Count	11		11
		% within VIA results	100.0%		100.0%
	Positive	Count	3	7	10
		% within VIA results	30.0%	70.0%	100.0%
Total		Count	14	7	21
% within VIA results		66.7%	33.3%	100.0%	

Table 6

			Result of colposcopy		Total
			Negative	Positive	
VIA results	Negative	Count	11		11
		% within Results of colposcopy-1	78.6%		52.4%
	Positive	Count	3	7	10
		% within Results of colposcopy-1	21.4%	100.0%	47.6%
Total		Count	14	7	21
% within Results of colposcopy-1		100.0%	100.0%	100.0%	

Table 7

		Result of Pap smear		Total
		Negative	Positive	
VIA results	Negative	77	2	79
	Positive	20	1	21
Total		97	3	100

Table 8: *VIA results *results of Pap smear crosstabulation.*

P value not significant 0.511.

Discussion

In this study, 100 women were screened for cervical cancer by two methods: Pap smear and VIA test. A confirmatory test namely colposcopy test was then carried out to compare their sensitivity and specificity (in addition to the positive and negative predictive values among studied women).

The study showed that most of the studied people were not screened before (except 3 women). In developed countries screening is routinely conducted.

The results of routine Pap smear screening in the industrialized world have been impressive, and the procedure has contributed to 70% to 80% reduction of cervical cancer incidence since the 1960s. Even in industrialized countries, however, the level of success can vary. For example, in the United States, where an overall decline in the number of cervical cancer cases has occurred, rates nonetheless remained high in impoverished areas.

This study showed that the most common complaints at the time of presentation were abnormal discharge.

Colposcopy is a standard confirmatory test. Of 11 samples sent for colposcopy, 3 were found positive for Pap smear test. For VIA seven positive samples out of 10 were confirmed positive by colposcopy. This result proves the high sensitivity of VIA compared to Pap smear.

In fact, sensitivity for VIA was 70%, compared to Pap smear which was 30% as confirmed by colposcopy this means that, VIA is more reliable in developing countries such as Sudan to detect positive results of cervical cancer. The variation in efficacy of the Pap smear test between developing and developed countries may be due to the difference in availability of qualified and well-trained histopathologists and quality of the health services provided. Although the study was conducted in the major hospital (KTH), which can provide good health services and has qualified staff and laboratories, still only two out of 80 histopathologists are well-trained.

Specificity of each test

Specificity was also found to be higher in VIA test compared to Pap smear test, 72.7% and 27.3% respectively. This indicates that VIA test is highly specific and proportionally trusted to detect negative results of cervical cancer. This agrees with the study conducted by Megaevent., *et al*. (1996) in South Africa who reported that VIA has higher specificity and disagrees with the study conducted in India by Sankaran Yanan., *et al*. (1998) who found that the performance of cervical cytology and VIA was similar with a sensitivity ratio and VIA was only 68% specific compared to 90% specificity of cytology.

In another study conducted by Rana., *et al*. (2010) in Pakistan, the same method of the current study was used. The samples were subjected to VIA and Pap smear test, then was confirmed by colposcopy using direct biopsy. It was revealed that the sensitivity of VIA was 93% and that of Pap smear was 83%. Corresponding specificities were 90% and 97%. VIA was more sensitive than Pap smear which was statistically significant (P value < 0.5). The PPV of VIA was 62.5% versus 83% for Pap smear which is statistically significant (P value < 0.001). The NPV of VIA was 98% versus 97% for cytology. There was no significant difference between the negative predictive values (NPV) of both tests (P value equals 1). In conclusion, VIA demonstrated an accuracy of 90% as compared to 96% for cytology [6].

PPV of VIA in this study is 70% against 30% in Pap smear, while the negative result was 72.7% for VIA against 27.3% for Pap smear. It is obvious that this study agrees with the study of Rana., *et al*. (2010) in sensitivity, and it differs in the PPV which is found to be higher in Pap smear than VIA, while NPV of VIA is slightly higher (98% against 97%) [7].

In this study, the reference standard was colposcopy which was done only for those who had positive findings in cervical cytology and positive findings in VIA. Therefore, this study suffered from verification bias, sensitivity and specificity measure the efficacy of screening test and the positive and negative predictive values measure its occurrence. Sensitivity and specificity could not be measured directly as a reference test. However, colposcopy was not applied to all. This bias may lead to an overestimation of sensitivity. The study presented the ratio of sensitivities between cytology and VIA and the approximated sensitivities and specificities of each parameter.

Conclusion

The study showed that VIA overall performance is better than cervical cytology in phrases of detecting precancerous lesions. High numbers of fake positive consequences for Pap smear may additionally cause high charges of referral and can growth fee of treatment which may be expressed in better expenses. This can be because of loss of assets and trained histopathologists.

Pap smear screening is typically utilized in advanced international locations, and it is hard to apply in Sudan because of many limitations and problems, specifically negative fitness fame and absence of educated cytologists.

This displays the want to apply different opportunity screening methods. Though Pap is extra unique than VIA, the test calls for an awesome infrastructure to be valid, useless to say significance of skilled cytologists to avoid the fake negative results.

Until then, there may be a want to utilize other opportunity assessments for detection of cervical most cancers. For the instant VIA is the proper one for such screening.

Recommendation:

- Further research should be conducted thinking about wider insurance, perfect and ideal approach to measure sensitivity, specificity, PPV and NPV.

- VIA is usually recommended as a screening technique to discover cervical cancer, as it fits the fitness surroundings of Sudan in its simplicity and value effectiveness.

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