Research Article

EVALUATING PAP SMEAR AS A SCREENING TEST FOR DETECTING PRE-MALIGNANT AND MALIGNANT CHANGES OF CERVIX

Apra Attri[1]., Priyanka Sharma[1]*., Sita Thakur[2]., Ashok Verma[2] and Kamal Singh[3]

[1]Dr. RPGMC, Kangra, HP, India
[2,3]Department of Obstetrics and Gynaecology, Dr. Rajendra Prasad Government Medical College, Kangra at Tanda, HP, India

ARTICLE INFO

ABSTRACT

Cervical cancer is the second most occurring cancer in women in developing countries. Most studies involving screening tests have been somewhat limited in northern India. We undertook a study to evaluate the results of cervical cytology as an effective screening test for low resource settings, evaluating its performance based on factors such as age, appearance of the cervix, and complaints of pain in lower abdomen and vaginal discharge. Age group of of 31-40 years showed the highest Sensitivity (71.43%), but lowest specificity (97.62%). Among the presenting complaints, sensitivity of pap smear in case of pain in lower abdomen was the lowest (33.34%), while in cases with vaginal discharge was the highest (66.67%).

INTRODUCTION

In low resource settings, such as in developing nations, Cervical cancer affects women disproportionately, primarily due to the logistical difficulties in maintaining cytology-based screening campaigns. It is the second most occurring cancer in women, presenting around 445,000 new cases per year[1]. Global estimates of new cervical cancer cases was around 530,232 in 2008[2], and India accounts for a quarter of the worldwide burden[3].

Standardised incidence rate (30.7/100,000) and age standardised mortality rate (17.4/100,000) of cervical cancer in India are the highest in south-central Asia[4]. The high rate of incidence is in part, is due to the lack of cytology-based screening campaigns[5].

Simple, cost-effective screening programmes to detect precancerous lesions will help in early detection and treatment of precancerous lesions[6]. The disease burden in developed and countries with high income has been reduced by Cytology based (such as pap smear) screening campaigns.In Himachal Pradesh, owing to harsh geographical conditions, screening tests become all the more useful for detecting cervical cancer in early stages, and thereby improving the prognosis.

Cervical cytology (Pap smear) is the most widely used screening test for cervical cancer.

Corresponding author: **Priyanka Sharma**
Dr. RPGMC, Kangra, HP, India

Studies involving screening tests like Pap smear have mostly been done in Southern India and are somewhat limited in northern India. We undertook a study to evaluate the results of cervical cytology (pap smear) as an effective screening test for low resource settings, evaluating its performance based on different factors.

METHODS

The study was conducted for a period of one year (01-02-2018 to 31-01-2019) on women who attended the Outdoor Patient Department of the Department of Obstetrics and Gynaecology, Dr. Rajendra Prasad Government Medical College, Kangra at Tanda, Himachal Pradesh. Women considered eligible were in the age group of 21 to 65, had intact uterus, had no history of vaginal examination in the past three days, had no immuno-supressing conditions, and had abstained from intercourse for atleast three days prior to the examination. Women with known cases of Ca Cervix were excluded from the study.

Pap Smear, Visual inspection using acetic acid (VIA), followed by Visual inspection using Lugol's iodine (VILI), was done on consenting participants. These patients were also subjected to a thorough pelvic examination. Conventional Pap Smears was taken using the Ayre spatula and endocervical brush, fixed in 95% ethanol, stained by the modified Papanicolaou method. The final cytological diagnosis was issued using the Bethesda system and the specimen was

classified as Adequate/Inadequate, and further as whether it was satisfactory for evaluation or not.

If a positive on any of the screening tests (pap smear/VIA/VILI) was obtained, colposcopy was performed during the follow-up appointment. After application of 5% acetic acid on the entire cervix, careful examination of the cervix and transformation zone was carried out.

Cervical biopsywas taken for cases in which any of the screening test or colposcopy had a positive finding. Additionally, ten percent women with normal Pap smear reports also underwent cervical biopsy. Tissue samples were fixed in formalin, and sent for histopathological examination to the Pathology Department at Dr. Rajendra Prasad Government Medical College, Kangra at Tanda.

Finally, the data was recorded in an excel sheet, and analysed using statistical software and Python scripts.

The results were compiled based on the following factors:

1. Cases where the patients had a healthy looking cervix
2. Cases where the patient presented with complaint of vaginal discharge
3. Cases where the patient presented with complaint of pain in lower abdomen
4. Age of the patient

The sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were then calculated for each factor.

RESULTS

For the total 350 women, Pap smear returned positive for 22 (6.28%) women, with 11 (3.14%) cases reported as L-SIL, 1 (0.28%) has H-SIL, 10 (2.86%) as ASCUS. The sensitivity was found to be 61.11%, specificity as 96.69%, PPV as 50%, and NPV as 97.86%.

Healthy Looking Cervix

Of the total 350 women in the study, 267 had healthy cervical appearance. About 23.1% (81 women) had cervical ectopy. Two women's cervix had unhealthy appearance.

Pap smear

Out of the total 267 cases, Pap smear was positive in 18 (6.74%) women. Eight women reported as ASCUS, and 10 reported as L-SIL. The results are shown in Table 1.

Table 1 Pap Results for Cases with Healthy Looking Cervix

	Number	%
NILM	204	76.40
Inflammatory	45	16.85
ASCUS	8	2.99
L-SIL	10	3.74

Cervical Biopsy

Of the total 267 women with healthy cervical appearance, cervical Biopsy returned positive in 11 (4.12%) women. The results are shown in Table 2.

Table 2 Cervical Biopsy Results for Cases with Healthy Looking Cervix

	Number	%
Not Taken	193	72.28
Negative	63	23.59
CIN-1	11	4.12

The Positive Predictive Value (PPV) was found to be 70%. The Negative Predictive Value (NPV) was 98.44%. The sensitivity of Pap smear was obtained to be 63.64% and the Specificity as 98.93%. The results are shown in Table 3.

Table 3 Pap Results vs Cervical Biopsy for Cases with Healthy Looking Cervix

	No.
True Positives	7
False Positives	3
False Negatives	4
True Negatives	253

Complaint – Vaginal Discharge

A total of 115 women presented with chief complaint comprising vaginal discharge. On further examination, 126 (36%) were found to have discharge.

Pap smear

Out of the total 126 cases, Pap smear was positive in 7 (5.56 %) women. Four women reported as ASCUS, and 2 reported as L-SIL. The results are shown in Table 4.

Table 4 Pap Results for Cases with Vaginal Discharge

	Number	%
NILM	100	79.37
Inflammatory	19	15.08
ASCUS	4	3.17
L-SIL	2	1.59
H-SIL	1	0.79

Cervical Biopsy

Of the 126 women, cervical biopsy returned positive for 3 (2.38%) cases. Detailed results are shown in Table 5.

Table 5 Cervical Biopsy Results for Cases with Vaginal Discharge

	Number	%
Not Taken	88	69.84
Negative	35	27.77
CIN-1	2	0.79
CIN-2/3	1	0.79

The Positive Predictive Value (PPV) was 66.67%. The Negative Predictive Value (NPV) was found to be 99.19%. The sensitivity of Pap smear was obtained to be 66.67% and the specificity as 99.19%. The results are shown in Table 6.

Table 6 Pap Results vs Cervical Biopsy for Cases with Vaginal Discharge

	No.
True Positives	2
False Positives	1
False Negatives	1
True Negatives	122

Complaint – Pain Lower Abdomen

A total of 106 (30.29%) women presented with complaint of pain in Lower Abdomen.

Pap smear

Out of the total 106 cases, Pap smear was positive in 8 (7.55%) cases. Four women reported as ASCUS, and four reported as L-SIL. The results are shown in Table 8.

Table 7 Cervical Biopsy Results for Cases with Pain in Lower Abdomen

	Number	%
Not Taken	76	71.70
Negative	24	22.64
CIN-1	6	5.66

Table 8 Pap Results for Cases with Pain in Lower Abdomen

	Number	%
NILM	79	74.53
Inflammatory	19	17.92
ASCUS	4	3.77
L-SIL	4	3.77

Cervical Biopsy

Cervical biopsy was positive for 6 (5.66%) cases. Detailed results are shown in Table 7.

The Positive Predictive Value (PPV) was found to be 50%. The Negative Predictive Value (NPV) was found to be 96.08%. The sensitivity of Pap smear was obtained to be 33.34% and the specificity as 98%. The results are shown in Table 9.

Table 9 Pap Results vs Cervical Biopsy for Cases with Pain in Lower Abdomen

	No.
True Positives	2
False Positives	2
False Negatives	4
True Negatives	98

By Age Group

Of the total 350 women, 65 (18.6%) were in the age group of 21-30 years, 133 (38%) in the age range of 31-40 years, 111 (31.7%) in the group of 41-50 years, 24 (31.7%) in the age group of 51-60 years, and 17 (4.9%) were in the age group of more than 60 years.

Pap smear

The age group of 31-40 years returned maximum number of positive cases, 11 or 8.27%. The detailed results are shown in Table 10.

Table 10 Pap Results for Different Age Groups

	Age Group				
	21-30	31-40	41-50	51-60	>60
NILM	50	101	86	18	14
Inflammatory	10	21	20	5	3
ASCUS	2	3	4	1	0
L-SIL	3	7	1	0	0
H-SIL	0	1	0	0	0

Cervical Biopsy

The maximum number, 7 (5.26%), of positive cases were found in the age group of 31-40 years, followed 21-30 years group, which had 6 (9.2%) positive cases. Detailed results are shown in Table 11.

Table 11 Cervical Biopsy Results for Different Age Groups

	Age Group				
	21-30	31-40	41-50	51-60	>60
Not Taken	45	93	81	21	12
Negative	14	33	27	3	3
CIN-1	6	6	3	0	1
CIN-2/3	0	1	0	0	1

The detailed results of Positive Predictive Value (PPV), Negative Predictive Value (NPV), sensitivity and the specificity are shown in Table 12.

Table 12 Pap Results vs Cervical Biopsy for Different Age Groups

	Age Group				
	21-30	31-40	41-50	51-60	>60
PPV (%)	100	62.5	100	-	-
NPV (%)	95.16	98.4	98.18	100	88.24
Sensitivity (%)	50	71.43	33.34	-	0
Specificity (%)	100	97.62	100	100	100

Table 13 Summary of Results of Sensitivity and Specificity

	PPV (%)	NPV (%)	Sensitivity(%)	Specificity(%)
Healthy Looking Cervix	70	98.44	63.64	98.93
Vaginal Discharge	66.67	99.19	66.67	99.19
Pain Lower Abdomen	50	96.08	33.34	96.08

DISCUSSION

Ghosh *et al*[7] found sensitivity of Pap smear to be 52.6%, which is lower than our study, and specificity to be 99.1%, which was higher. Yagnik *et al*[8] found sensitivity as 59.70% and specificity as 95.26%, both of them being lower than our study. Diversity in results can be attributed to the difference in factors such as the mean age of the patients and methodology.

The summary of results for different factors considered in this study are shown in Table 13. The results by age are shown in Table 12.

The pap smear in women with the complaint of pain in lower abdomen showed the lowest sensitivity and specificity when compared to other presenting complaints. The sensitivity of pap smear done in women with vaginal discharge on per-speculum examination was higher than in women with healthy looking cervix on per speculum examination. Negative Predictive Value was highest for women with vaginal discharge, followed by women with healthy looking cervix, and finally by women with pain in their lower abdomen.

Among the age groups, women in the age group of 31-40 years showed the highest sensitivity of 71.43%. Specificity was high among all groups, with only age group of 31-40 showing specificity less than 100%. Negative Predictive Value (NPV) was highest for the age group of 51-60 years. Both age groups of 21-30 years and 41-50 years showed the highest Positive Predictive Value (PPV).

High values of specificity and NPV demonstrate that pap smear can be used as a tool to eliminate the possibility of pre-malignant and malignant changes of cervix. In low resource settings this can save time and resources in patients who are not suffering from cervical cancer and help reduce burden on the healthcare system. The results of this study indicate that pap smear alone is not very sensitive, and other screening tests like VIA and VILI should be explored to complement pap smear as a screening test for developing countries with access to limited infrastructure.

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