

**Research Article****A Study of Early Detection of Carcinoma Cervix by Pap Smear, Colposcopy and Guided Biopsy**

Authors

**Dr Ramakrishna Mahapatra<sup>1</sup>, Dr Sini Venugopal<sup>2\*</sup>, Prof (Dr) Rabindra Nath Behera<sup>3</sup>**<sup>1</sup>Final Year PG, Department of Obstetrics and Gynecology, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha, India<sup>2</sup>Associate Professor, Department of Obstetrics and Gynecology, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha, India<sup>3</sup>Professor, Department of Obstetrics and Gynaecology, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha, India

\*Corresponding Author

**Dr Sini Venugopal**

Associate Professor, Department of Obstetrics and Gynecology, Hi-Tech Medical College &amp; Hospital, Bhubaneswar, Odisha, India

**Abstract**

**Objective:** *This is a prospective observational study carried out in Department of Obstetrics and Gynaecology, Hi-Tech Medical College & Hospital, Bhubaneswar, a tertiary care centre, with the aim to assess the accuracy of the methods employed for early detection of cervical neoplasms and to correlate the findings of cytology, colposcopy and histopathology carried out on women with unhealthy cervix.*

**Materials and Methods:** *A total of 100 patients, who were sexually active, who fulfilled the inclusion criteria were included in the study. The study was conducted over a two year period i.e. from September 2022 to June 2024 at Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha.*

**Results:** *The sensitivity and specificity of pap smear was 42.85% and 93.10% respectively. The sensitivity and specificity of colposcopy was 61.90% and 96.55%. Colposcopy also had a higher accuracy (82%) than pap smear (72%). When combining cytology with colposcopy, the likelihood of detecting squamous intraepithelial lesions or malignancy in patients with cervical abnormalities significantly increases compared to using either procedure alone.*

**Conclusion:** *Cervical cytology is a valuable procedure for cervical screening, due to the ease of performing the test without much expertise. Colposcopy is an excellent tool for evaluating cervical lesions by pin-pointing the most suspicious area for a targeted biopsy which yields highly accurate results.*

**Keywords:** *Cervical cytology, colposcopy, biopsy, CIN, cervical carcinoma.*

## Introduction

Carcinoma cervix is an increasing health problem and an important cause of mortality in women worldwide. According to WHO, it is the second most common cause of cancer among women. In the year 2020, 604,127 women reported with cervical cancer and 341,831 women died from the disease globally.<sup>2,3,4,5</sup> The maximum proportion of cervical cancer cases was reported from Asia (58.2%) and the minimum from the Northern American region (2.5%). The recent estimate for 2018 showed that 569,847 new cases were diagnosed worldwide during the year, and approximately four-fifth of them was from the less developed regions. Globally, the age standardized incidence and mortality rates are found to be 13.1 and 6.9 per 100,000 women.

But these rates are quite higher among Indian women in comparison to global estimates. In India the age standardized incidence rate is 14.7 per 100,000 women and the age standardized mortality rate is 9.2 per 100,000 women.

Cervical carcinoma is associated with sexual behaviours such as poor genital hygiene, early age of marriage, multiple sexual partners and repeated pregnancies. Cervical cancer develops through a continuous process of evolution, beginning with morphologically identifiable stages of mild dysplasia, followed by intraepithelial neoplastic changes which can proceed to invasive carcinoma. Early detection in its preclinical stage ensures possibly 100% survival rate. Cervical pap smear is a simple, safe, non-invasive and effective method for screening of precancerous lesions in the cervix.<sup>1</sup> But a pap smear is only a screening test. A positive test requires further investigations like colposcopy, cervical biopsy and fractional curettage. Colposcopy stands between cytology and histology i.e between screening and definite tissue diagnosis.<sup>6,7,8</sup> It helps in determining the location, size and extent of abnormal cervical lesions and serves for detecting the site for biopsies. Colposcopy is complimentary to cytology. It can detect the most suspicious areas

for targeted biopsy which helps to exactly diagnose the nature of the lesion which is crucial for planning effective management.

## Aims and Objectives

- 1) To detect carcinoma of cervix in its preinvasive stage.
- 2) To obtain colposcopic directed biopsy from suspicious and abnormal areas of cervix.
- 3) To correlate pap smear, colposcopy and histopathological finding.

## Methodology

This prospective study on “Clinical, Ultrasonographic and Laparoscopic Evaluation of Chronic Pelvic Pain” was conducted in the Department of Obstetrics and Gynaecology, Hi-Tech Medical College and Hospital, Bhubaneswar from September 2022 till June 2024.

## Source of Data

Women attending the OPD at the Department of Obstetrics and Gynecology at Hitech Medical College and Hospital, Bhubaneswar, Odisha.

## Methods of Collection of Data

- **Study Design:** Preprospective Observational Study
- **Study Period:** 1<sup>st</sup> September 2022 till 30<sup>th</sup> June 2024
- **Sample Size:** 100 cases who fulfilled the selection inclusion criteria

## Inclusion Criteria

- All sexually active women of age group upto 65 years.
- Women with abnormal vaginal discharge, abdominal pain, irregular menstrual bleeding,
- Women with post menopausal bleeding, post coital bleeding, intermenstrual bleeding.
- Women with prolapse of uterus.

- Patient with unhealthy cervix diagnosed by speculum examination.

#### Exclusion Criteria

- Women of age > 65 years and < 20 years.
- Women with diagnosed case of cancer.
- Pregnant women.
- Post total hysterectomy patients.

#### Procedure

All participants provided a written and informed consent after a concise explanation of the procedure was given to them.

#### History

The menstrual and obstetric history of each patient was recorded in connection with their presenting complaints, age, age at marriage, socio-economic status based on the B G Prasad Classification, educational background, and any history of previous cervical surgeries.

#### Examination

The patients were positioned dorsally, the labia were separated and a Cusco's self-retaining speculum was carefully inserted without the use of any lubricant or jelly. The cervix was then exposed and examined for any visible pathological features under sufficient lighting, and the findings were documented.

#### Pap smear

A pap smear was obtained using a Ayre's spatula and were sent to cytopathological laboratory. The results were reported according to the Revised Bethesda System.

#### Visual inspection with acetic acid (VIA)

After taking the pap smear, 3% acetic acid was applied on the cervix, and the cervix was inspected after one minute.

The Information Agency for Research on Cancer (IARC) guidelines were used for reporting VIA test.

#### Colposcopy

Colposcopy was performed on all women regardless of their VIA results. The procedure utilized normal saline, a green filter and acetic acid. Findings were documented, and the colposcopic diagnosis was determined using the Modified Reid Colposcopic Index (RCI).<sup>17</sup>

The cervix was first visualized unprepared after being moistened with normal saline to enhance the transparency of the surface. This allowed for assessment of gross lesions, vascular details and the opacity of the epithelium. The cervix was then viewed using a green filter to study the vascular configuration of the tissue. The blood vessels appeared as dark structures against the green background, and their pattern was noted. Following this, the cervix was treated with a freshly prepared 3% acetic acid solution, applied generously and gently to avoid any bleeding. If necessary, this application of the 3% acetic acid was repeated.<sup>10, 14</sup>

The following were noted:

- The presence or absence of an acetowhite patch.
- The location of the acetowhite patch in relation to the squamocolumnar junction.
- The intensity of the acetowhite patch.
- The margin of the acetowhite patch.

Finally, the cervix was painted with Lugol's iodine and inspected.

Reid et al (1983) defined three objective categories based on a colposcopic index using four colposcopic signs: Color, margin (including surface contour), vascular pattern and iodine response. Each category is assigned scores ranging from 0 to 2. The scores are then summed up.

Scores of 0-2: Predictive of minor lesion (CIN I or HPV)

Scores of 3-5 : Middle grade lesion (CIN I-II)

Scores of 6-8 : Significant lesion (CIN II-III)

### Colposcopic Guided Biopsy

Biopsies were obtained from abnormal areas under colposcopy guidance using cervical punch biopsy forceps. In cases where no abnormality was detected on colposcopy, a four-quadrant biopsy was taken from the ectocervix at the squamocolumnar junction. The specimens were then sent for histopathological examination in formalin solution. Slides were analyzed by a senior pathologist.

Biopsy results were categorized as :

- Cervicitis/Metaplasia

- CIN – I (mild dysplasia correlating with LSIL)
- CIN – II/III (moderate to severe dysplasia correlating with HSIL)
- Squamous cell carcinoma

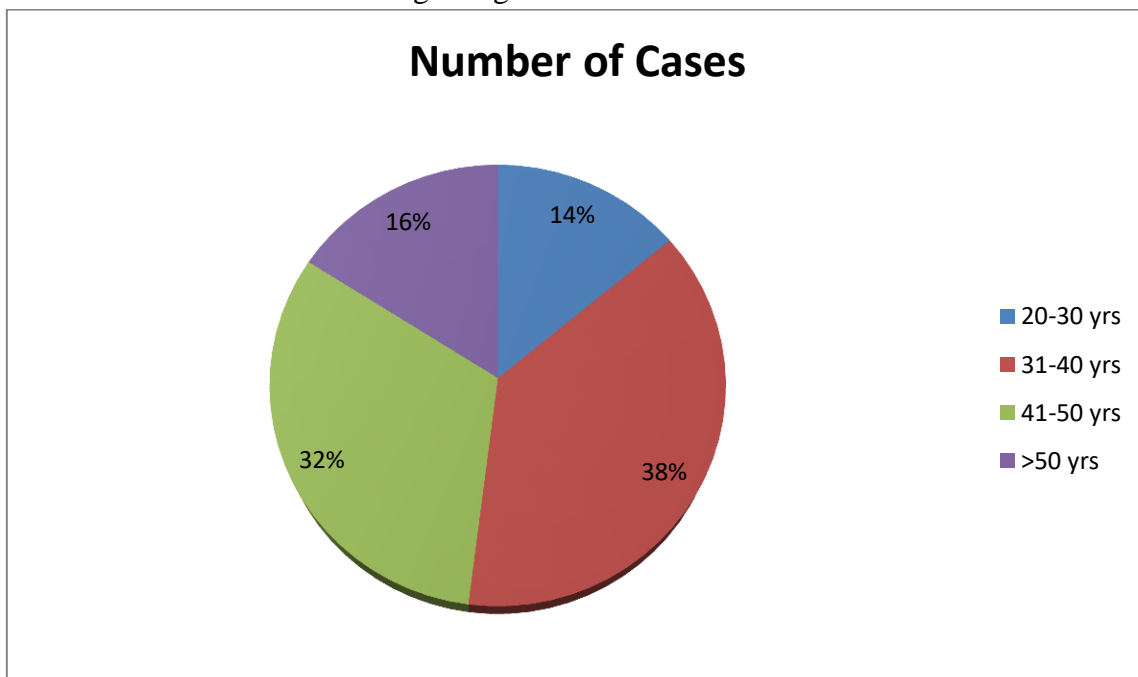
### Statistical Analysis

The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), false positive rate, false negative rate and accuracy were calculated for both pap smear and colposcopy, using colposcopy-directed biopsy results as the gold standard.

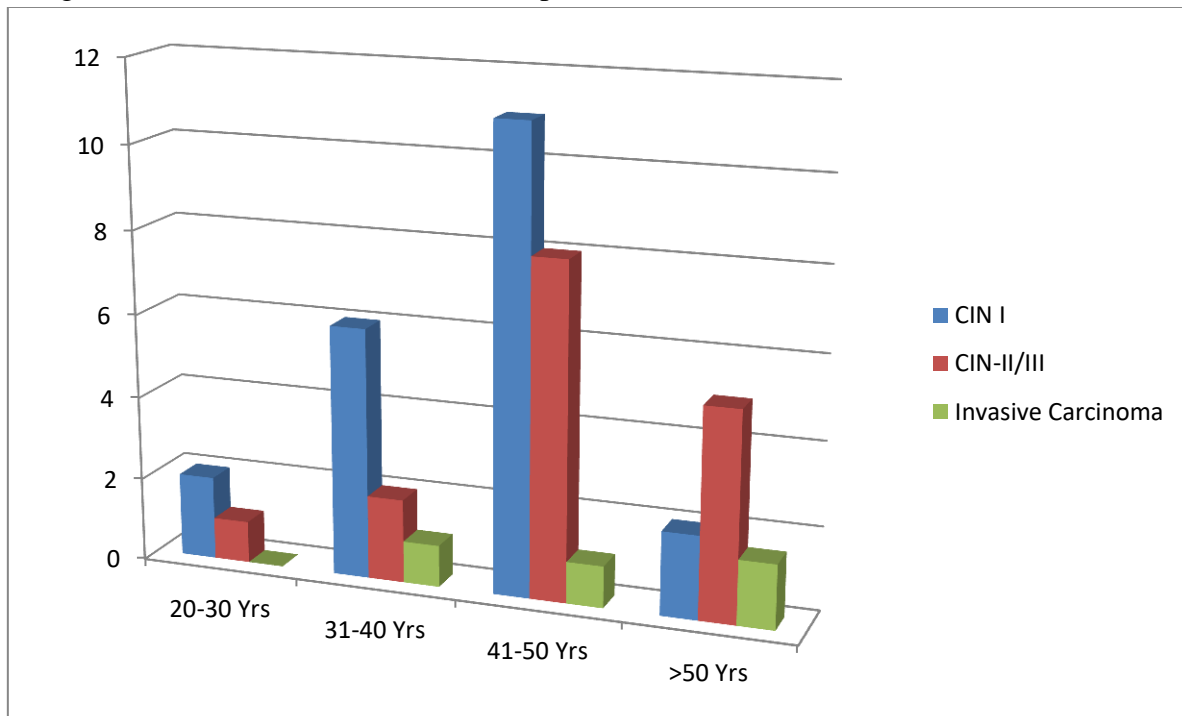
## Result

### Observation

**Graph 1:** Distribution of Cases According to Age



**Graph 2:** Age Wise Distribution of Cervical Neoplasia



**Table 1:** Distribution of Cases according to Age

Age Group	Number of Cases (n=100)
20-30 Yrs	14
31-40 Yrs	38
41-50 Yrs	32
>50Yrs	16

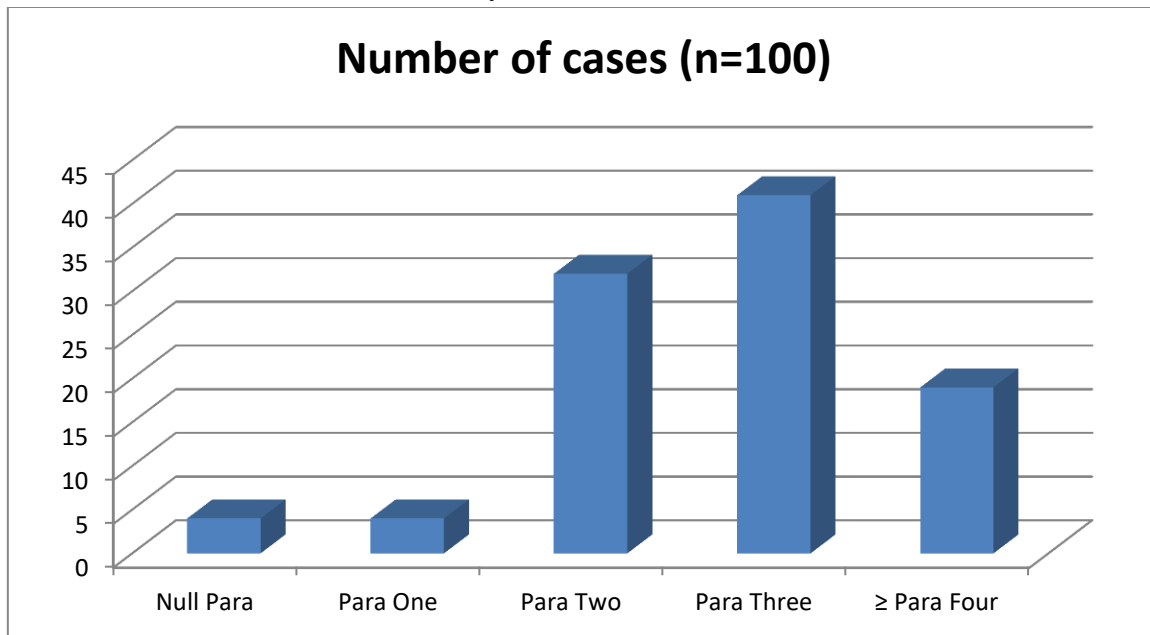
Maximum number of cases were found to be in the age group 31-40 years (38%). The mean age was 40.43 years.

**Table 2:** Age wise Distribution of Cervical Neoplasia

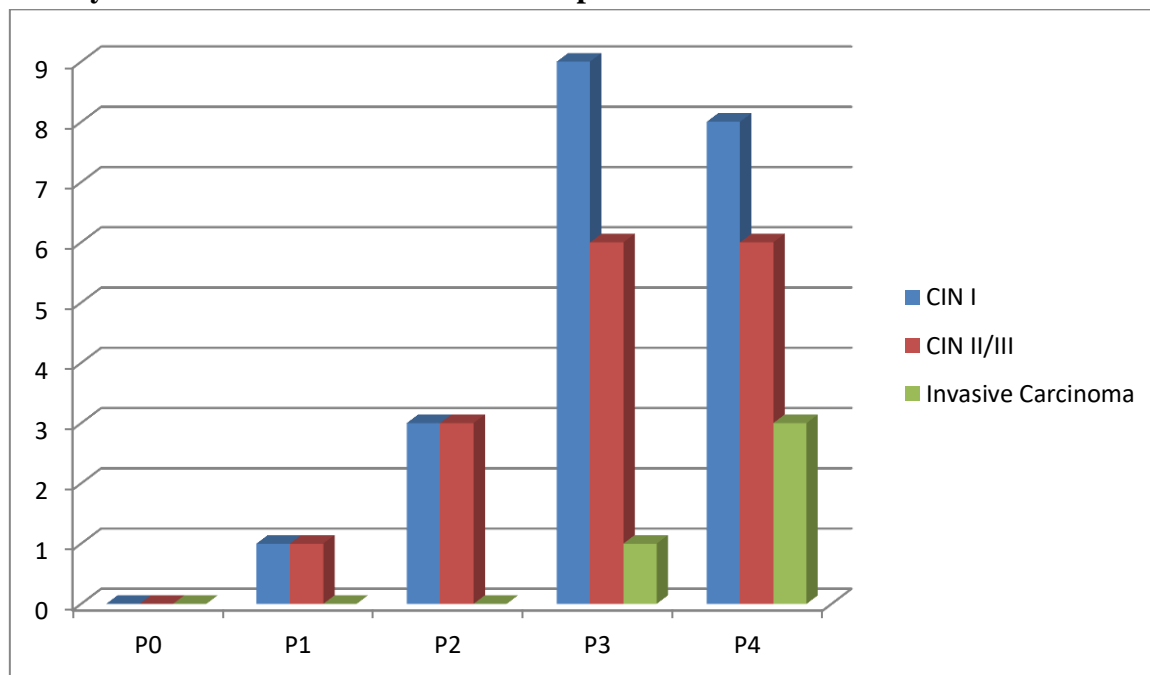
Age Group	Number of Cases (n=100)	CIN I		CIN II/III		Invasive Carcinoma	
		No	%	No	%	No	%
20-30 yrs	14	2	9.52	1	6.25	0	0
31-40 yrs	38	6	28.57	2	12.50	1	25
41-50 yrs	32	11	52.38	8	50.00	1	25
50 yrs or more	16	2	9.52	5	31.25	2	50
TOTAL	100	21	100.00	16	100	4	100

Among 100 cases, majority were distributed in the age group of 31 to 40 years. Mean age is 40.43 years. Among 21 cases of CIN I, majority were in the age group with mean age of 41.64 years. About 16 cases of CIN II/III, 8 cases were in the age group of 41 to 50 years, with mean age 46.09. Invasive carcinoma were detected in 4 cases, two cases belonging to age group of > 50 years with mean age of 50.5 years.

**Graph 3: Distribution of Cases Based on Parity**



**Graph 4: Parity Wise Distribution of Cervical Neoplasia**



**Table 3: Distribution of Cases Based on Parity**

PARITY	Number of cases (n=100)	%
Null Para	4	4%
Para One	4	4%
Para Two	32	32%
Para Three	41	41%
≥ Para Four	19	19%
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

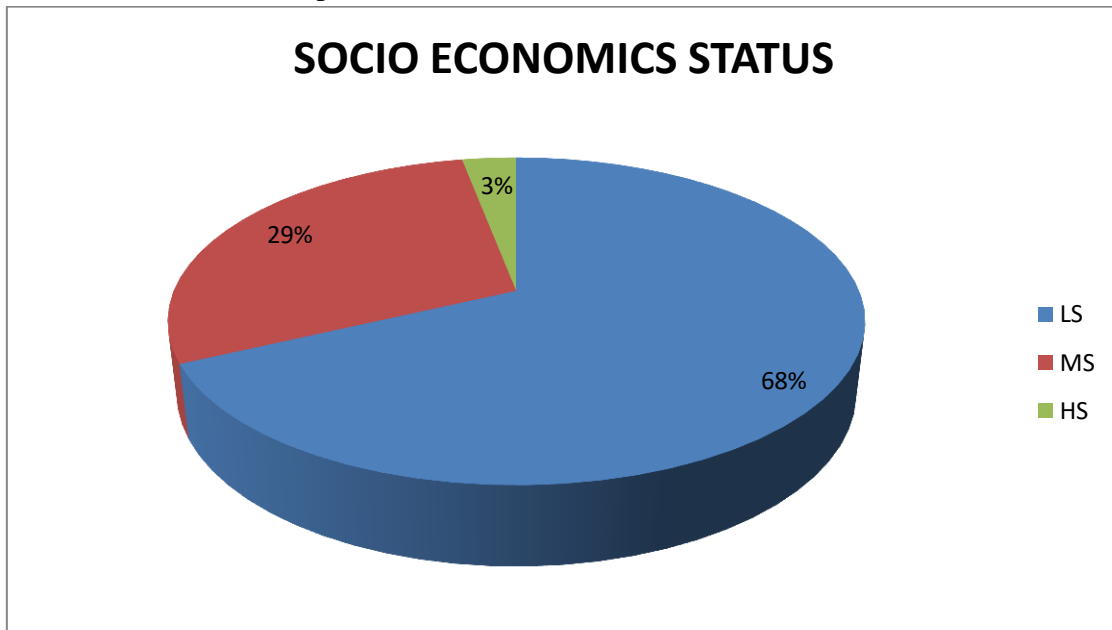
Majority of the study group were para two (32%) and para three (41%).

**Table 4:** Parity Wise Distribution of Cervical Neoplasia

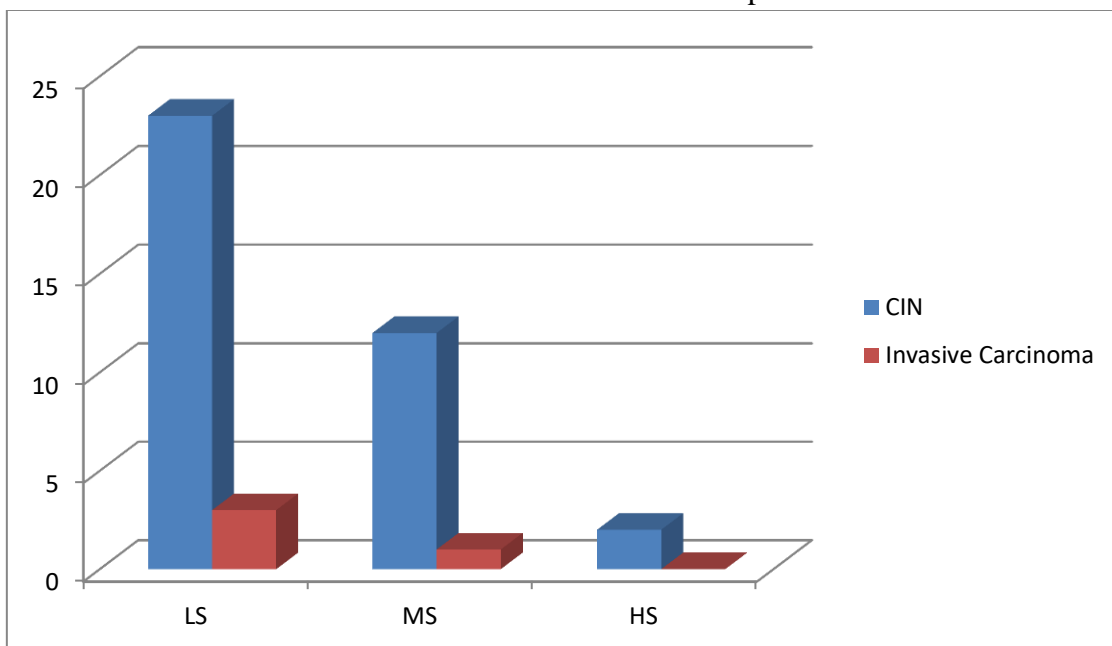
PARITY	Number of cases (n=100)	CIN		Invasive Carcinoma
		I	II/III	
Null Para	4	0	0	0
Para One	4	1	1	0
Para Two	32	3	3	0
Para Three	41	9	6	1
≥ Para Four	19	8	6	3

Table 4 demonstrates that the occurrence of all neoplastic changes rises with the number of pregnancies. The majority of neoplastic changes are observed after the second pregnancy and beyond.

**Graph 5:** Distribution of Cases as per Socio Economic Status



**Graph 6:** Socio Economic Status Wise Distribution of Cervical Neoplasia



**Table 5:** Distribution of Cases as per Socio Economic Status

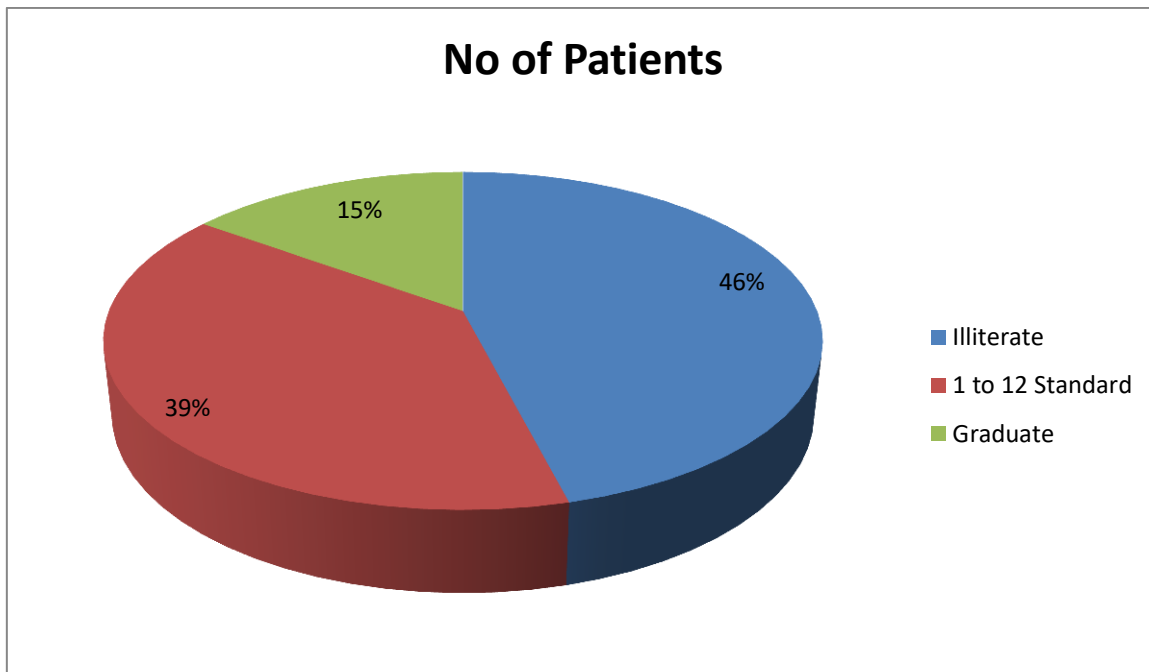
Socio Economic Status	No. of Patients (Frequency)	Percentage
LS- Lower Class	68	68%
MS- Middle Class	29	29%
HS- High (Upper) Class	3	3%
TOTAL	100	100%

**Table 6:** Socio Economic Status Wise Distribution of Cervical Neoplasia

Socio Economic Status	No. Of Patients (Frequency)	CIN Cases		Invasive Carcinoma	
		No.	%	No.	%
LS- Lower Class	68	23	62.16%	3	75.00%
MS- Middle Class	29	12	32.43%	1	25.00%
HS- High (Upper) Class	3	2	5.41%	0	0.00%
<b>TOTAL</b>	<b>100</b>	<b>37</b>	<b>100.00%</b>	<b>4</b>	<b>100.00%</b>

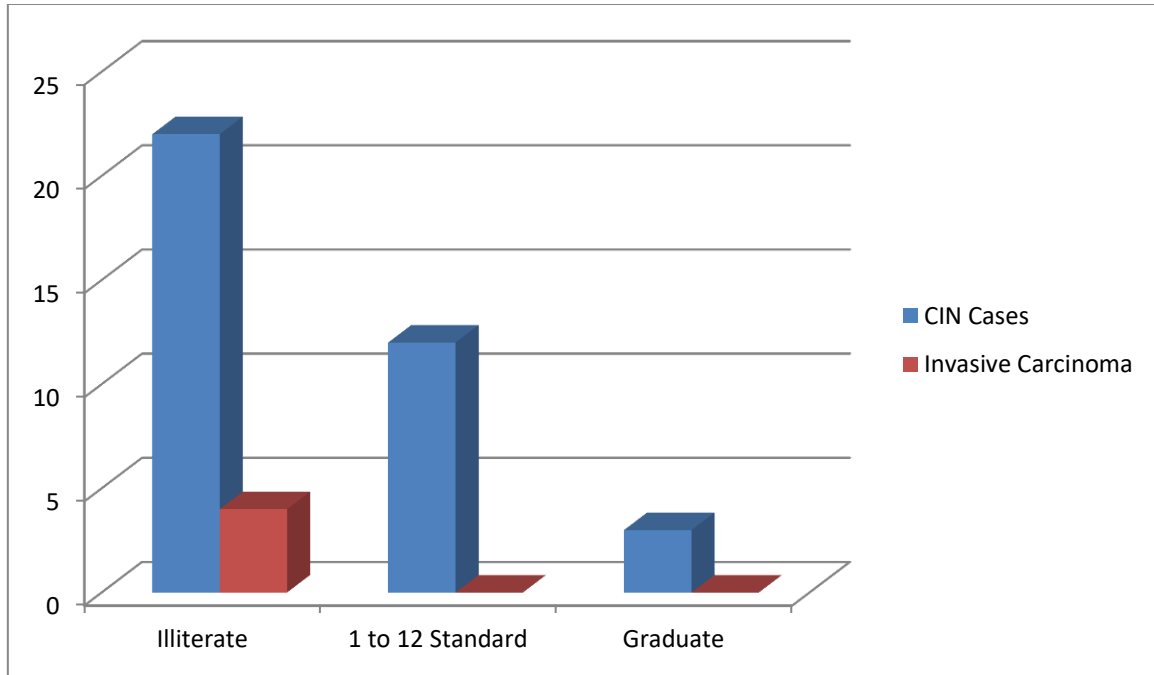
Table 6 shows that, dysplasia was identified in 37 cases, with 23 patients (62.16%) from a low socio economic status, 12 patients (32.43%) from a middle class background, and 2 patients (5.41%) from a high (upper) socio economic status. Invasive carcinoma was found in 4 patients, of which 3 patients (75%) were from the lower class and 1 patient (25%) was from a middle socio economic status.

**Graph 7:** Distribution of Patients Based on Education Status





**Graph 8:** Education Status Wise Distribution of Cervical Neoplasia



**Table 7:** Distribution of Patients based on Education Status

Education Status	No. of Patients	Percentage
Illiterate	46	46%
1 to 12 Standard	39	39%
Graduate	15	15%
<b>TOTAL</b>	<b>100</b>	<b>100%</b>

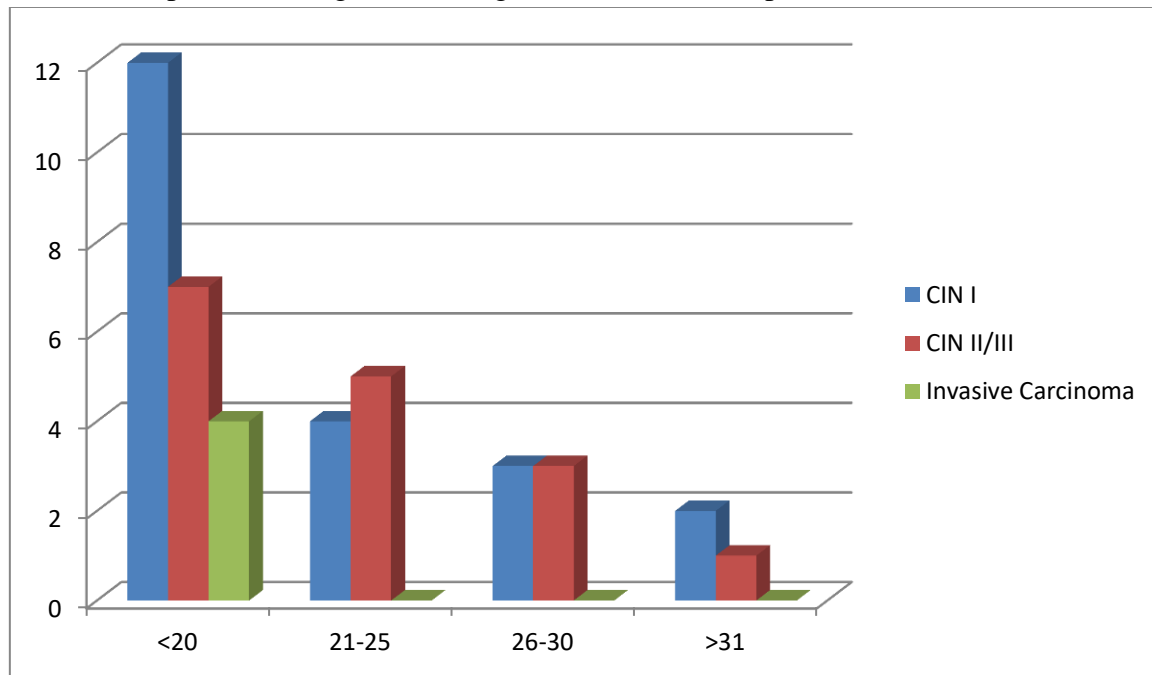
Among 100 cases 46% were illiterates, 39% had studied upto 12<sup>th</sup> standard and 15% were graduates. Unhealthy cervix was more prevalent among illiterates.

**Table 8:** Education Status Wise Distribution of Cervical Neoplasia

Education Status	No. of Patients	CIN Cases		Invasive Carcinoma	
		No.	%	No.	%
Illiterate	46	22	59.46%	4	100%
1 to 12 Standard	39	12	32.43%	0	0
Graduate	15	3	8.11%	0	0
<b>TOTAL</b>	<b>100</b>	<b>37</b>	<b>100.00%</b>	<b>4</b>	<b>100%</b>

Among 100 women studied, 46% were illiterate, 39% had primary high school education and 15% had higher education, among total CIN 59.49% were illiterate, 32.43% studied upto high school and 8.11% had higher education. Among total invasive cases 100% were illiterate. This showed that higher incidence of CIN and invasive carcinoma were among the illiterates than literates.

**Graph 9:** Relationship Between Age of Marriage And Cervical Neoplasia

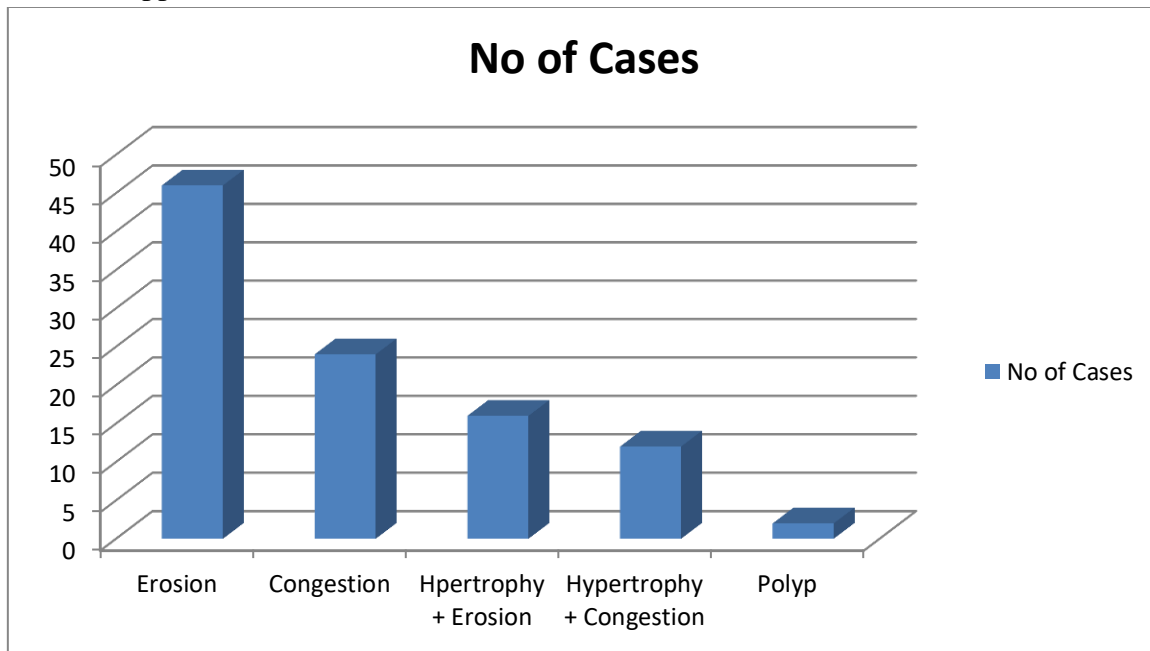


**Table 9:** Age of Marriage and Distribution of Cervical Neoplasia

Age of Marriage in years	Total No. of Cases	%	CIN I		CIN II/III		Invasive Carcinoma	
			No.	%	No.	%	No.	%
<20	54	54%	12	57.14%	7	43.75%	4	100%
21-25	32	32%	4	19.05%	5	31.25%	0	0
26-30	11	11%	3	14.29%	3	18.75%	0	0
>31	3	3%	2	9.52%	1	6.25%	0	0
<b>TOTAL</b>	<b>100</b>	<b>100%</b>	<b>21</b>	<b>100.00%</b>	<b>16</b>	<b>100.00%</b>	<b>4</b>	<b>100%</b>

Out of 100 women, 54 were under 20years old, 32 were between 21 and 25, 11 were between 26 and 30 and 3 were over 31. Of the 21 CIN I cases, 12 (57.14%) were married before the age of 20. Among the 16 CIN II cases, 7 (43.75%) were married before 20. All 4 cases of invasive carcinoma involved women who married before the age of 20.

**Graph 10:** Gross Appearance of Cervix

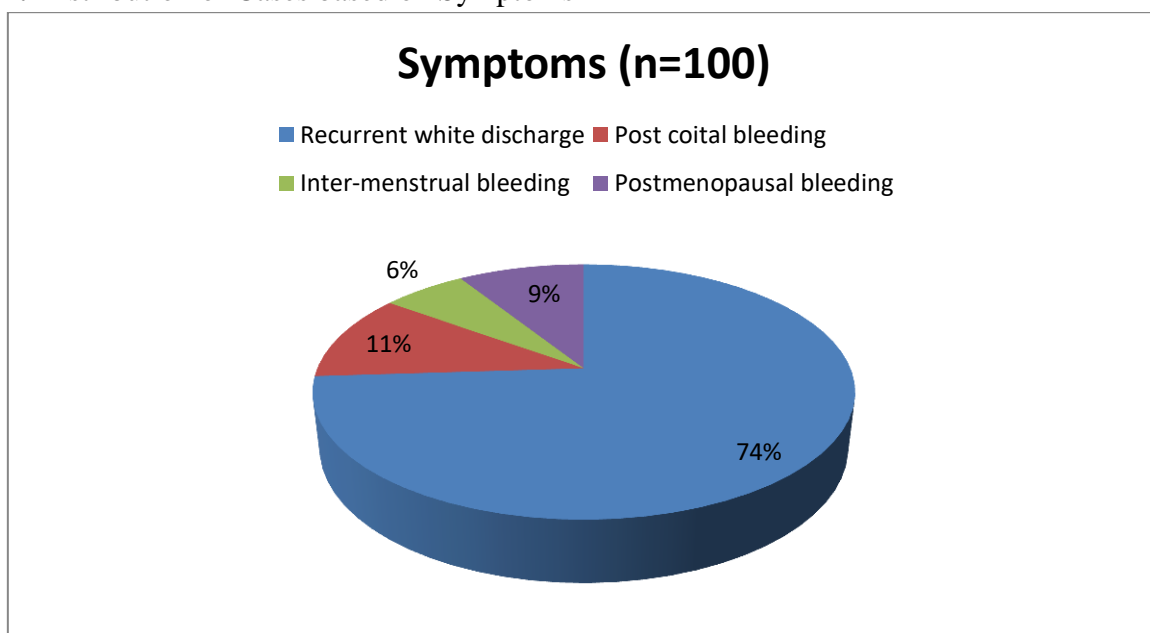


**Table 10:** Distribution of Cases as per Gross Appearance of Cervix

Gross Appearance of Cervix	No. of Cases	Percentage
Erosion	46	46%
Congestion	24	24%
Hypertrophy + Erosion	16	16%
Hypertrophy + Congestion	12	12%
Polyp	2	2%

In the present study, the highest no of cases (46%) exhibited erosion, followed by congestion in 24 cases. Hypertrophy with erosion was observed in 16% of cases, while hypertrophy with congestion occurred in 12% of cases. Polyps were seen in 2% of cases.

**Graph 11:** Distribution of Cases based on Symptoms



**Table 11:** Distribution of Cases Based on Symptoms

Symptoms	Number of Cases (n=100)
Recurrent white discharge	74
Post coital bleeding	11
Inter-menstrual bleeding	6
Postmenopausal bleeding	9

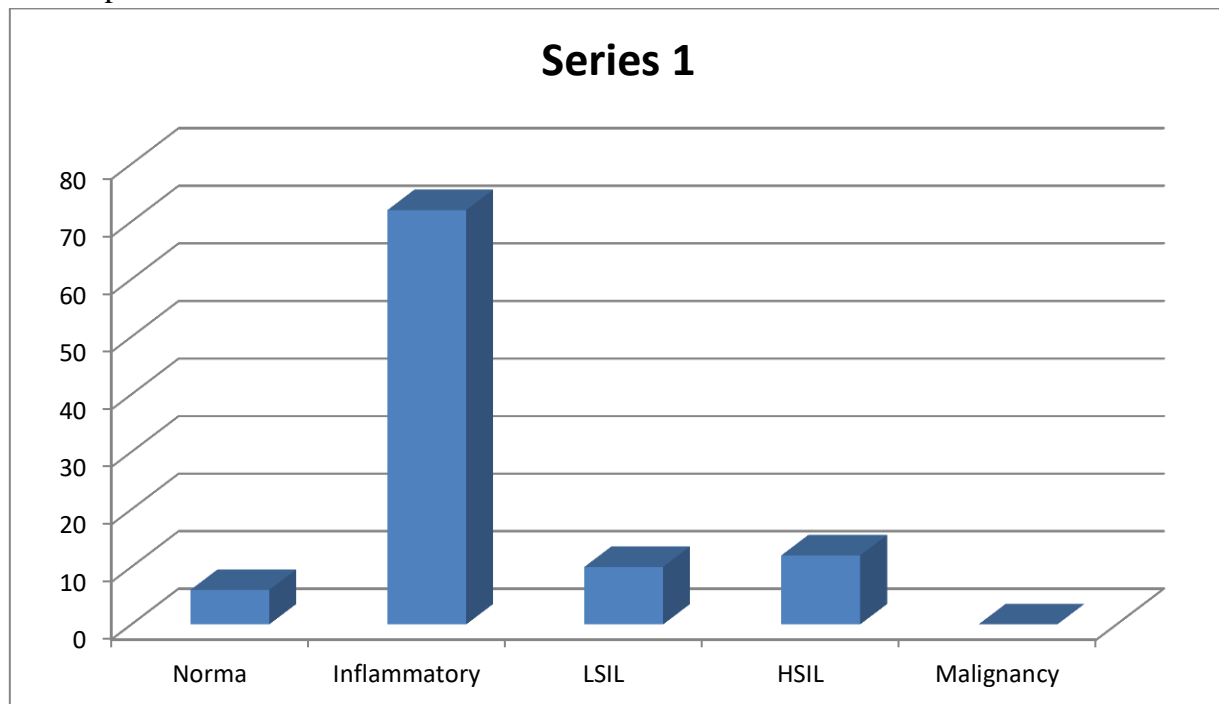
The commonest symptom was recurrent white discharge per vagina (74%)

**Table 12:** Visual Inspection with Application of Acetic Acid

Total	No of Cases (n=100)
Positive	46
Negative	54

46 women out of 100, had a positive result and 54 women had a negative result on VIA.

**Graph 12:** Pap Smear Results

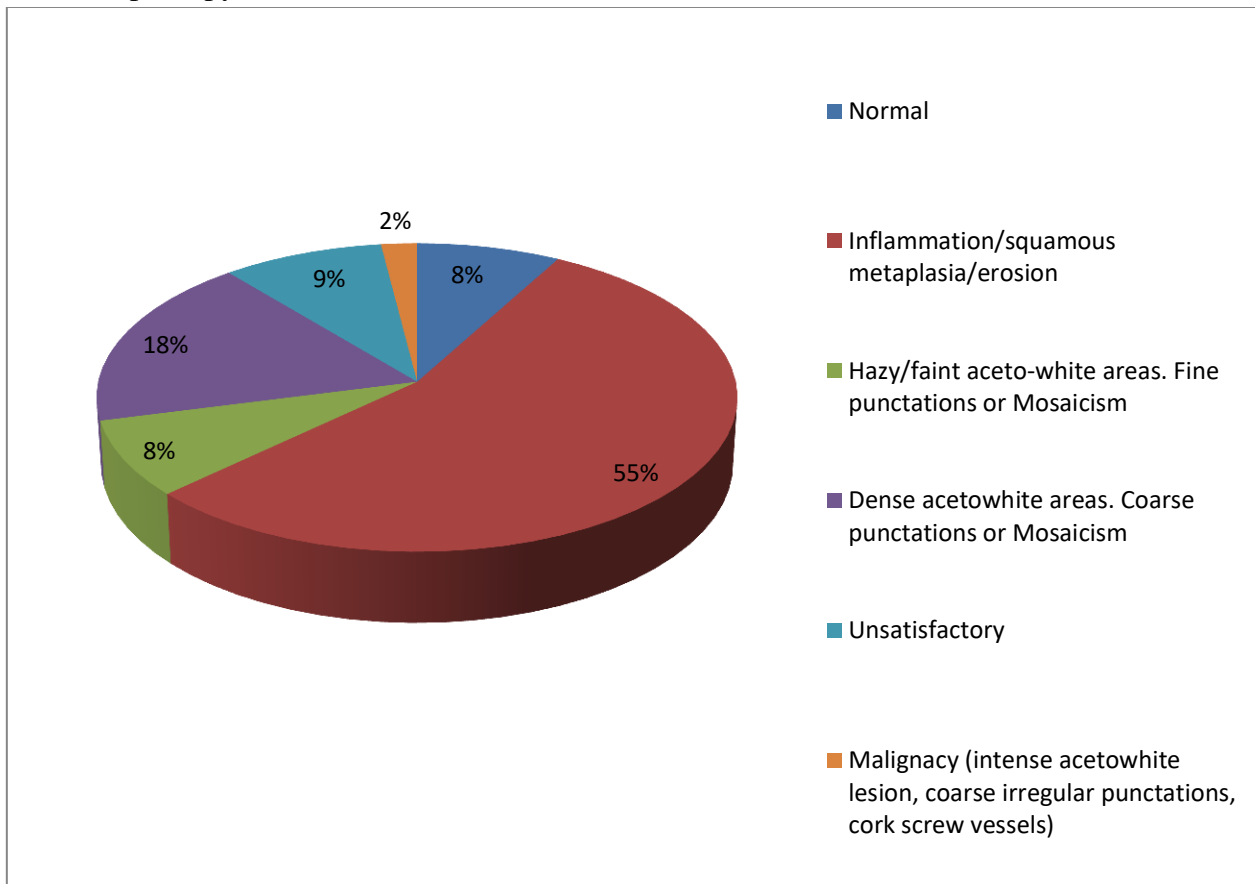


**Table 13:** Pap Smear Results

Outcome	No. of Cases (n=100)
Normal	6
Inflammatory	72
LSIL	10
HSIL	12
Malignancy	0

Papsmear revealed that 72% had an inflammatory smear and 22% had a positive Pap smear. The result of Pap smear was considered positive if it revealed LSIL, HSIL, carcinoma in situ or invasive cancer. Among 22 positive cases, there were 10 LSIL, 12 HSIL and no case of malignancy.

**Graph 13: Colposcopy Results**

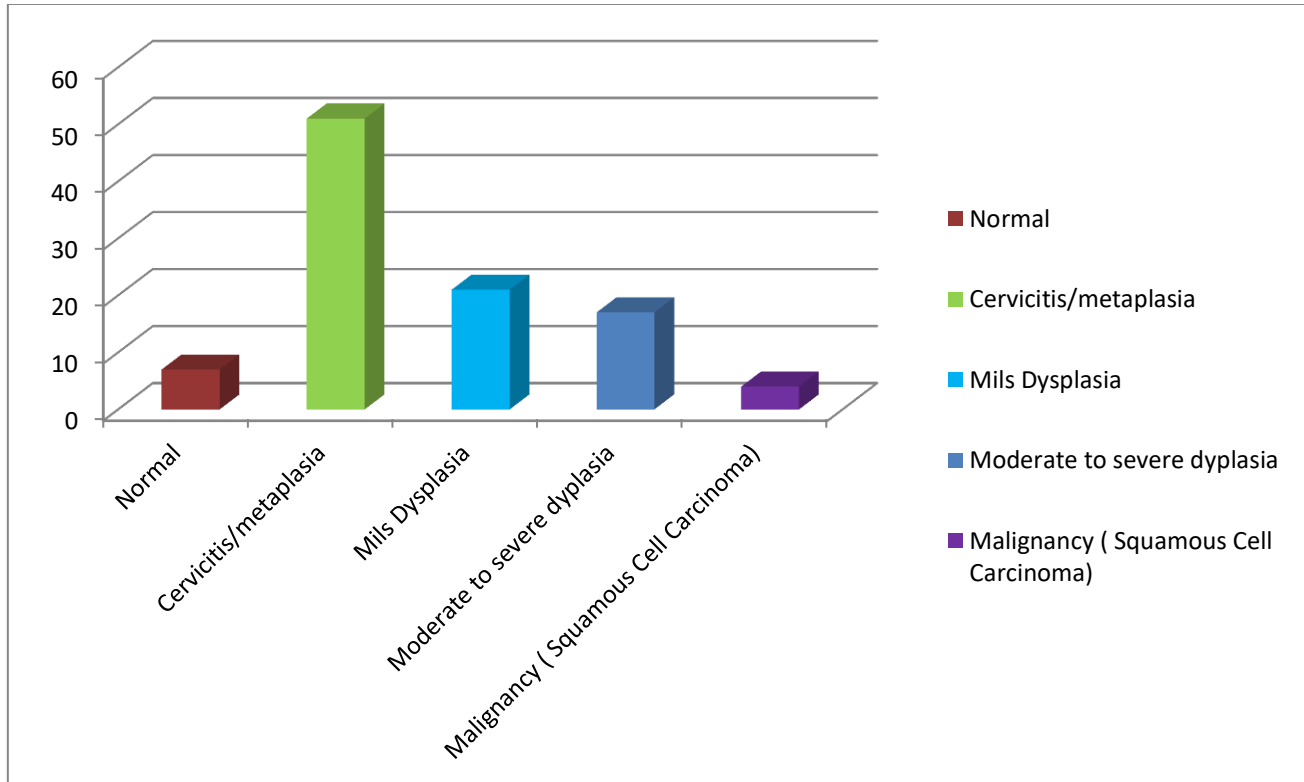


**Table 14: Colposcopy Results**

Outcome	No. of Cases
Normal	8
Inflammation/squamous metaplasia/erosion	55
Hazy/faint aceto-white areas. Fine punctations or Mosaicism	8
Dense aceto-white areas. Coarse punctations or Mosaicism	18
Unsatisfactory	9
Malignancy (intense aceto white lesion, coarse irregular punctations, cork screw vessels)	2

On Colposcopy, 28% women were found to have a positive result. Colposcopy was considered positive if it revealed lesions of LSIL and above. Among the 28 women with abnormal colposcopies, there were 8 LSIL, 18 HSIL and 2 cases suspicious of malignancy. Colposcopy was unsatisfactory in 9 cases.

**Graph 14: Biopsy Results**



**Table 15: Biopsy Results**

Outcome	No. of Cases (n=100)
Normal	7
Cervicitis/ Metaplasia	51
Mild Dysplasia	21
Moderate to severe dysplasia	17
Malignancy ( Squamous cell carcinoma)	4

Positive biopsy includes 42 cases out of 100. Biopsy was considered positive if it revealed LSIL and above. It includes 21 mild dysplasias (LSIL), 17 moderate to severe dysplasias( HSIL) and 4 malignancies. Out of 4 malignancies, none had visible growth on per speculum examination.

**Table 16: Correlation between Pap Smear and Biopsy**

Pap Smear	Biopsy					Total
	Normal	Cervicitis/ Metaplasia	LSIL	HSIL	Malignancy	
Normal	0	6	0	0	0	6
Inflammatory	7	43	14	8	0	72
LSIL	0	2	5	2	1	10
HSIL	0	0	2	7	3	12
<b>Total</b>	<b>7</b>	<b>51</b>	<b>21</b>	<b>17</b>	<b>4</b>	<b>100</b>

22 cases out of 100 women were positive on Pap smear. 42 out of 100 women were positive on Biopsy. Pap smear was positive in 16 out of 37 biopsy proven positive cases. 14 cases of LSIL and 8 cases of HSIL were under reported as inflammatory on Pap smear. 2 cases of cervicitis/ metaplasia were over reported as LSIL / HSIL.

**Table 17:** Correlation between Colposcopy and Biopsy

Colposcopy	Normal	Cervicitis/ Metaplasia	Mild Dysplasia	Moderate / Severe Dysplasia	Malignancy	Total
Normal	2	6	0	0	0	8
Inflammatory/ Squamous metaplasia/ erosion	5	37	12	1	0	55
Hazy / Faint aceto-white areas, fine punctuations or mosaicism	0	1	6	1	0	8
Dense aceto-white areas, coarse punctuations or mosaicism	0	0	3	12	3	18
Unsatisfactory	0	7	0	2	0	9
Malignancy	0	0	0	1	1	2
<b>Total</b>	<b>7</b>	<b>51</b>	<b>21</b>	<b>17</b>	<b>4</b>	<b>100</b>

28 out of 100 women were positive on colposcopy. 42 out of 100 women were positive on biopsy. Colposcopy was positive in 26 out of 42 biopsy proven positive cases. Colposcopy was unsatisfactory in 9 cases. 12 cases of mild dysplasia and 1 case of moderate/ severe dysplasia were under reported as metaplasia / erosion on colposcopy. 1 case of cervicitis / metaplasia were over reported as LSIL/ HSIL on colposcopy.

**Table 18:** Diagnostic Efficacy of Pap Smear

Pap Smear	Biopsy		Total
	Positive	Negative	
Positive	18	4	22
Negative	24	54	78
<b>Total</b>	<b>42</b>	<b>58</b>	<b>100</b>

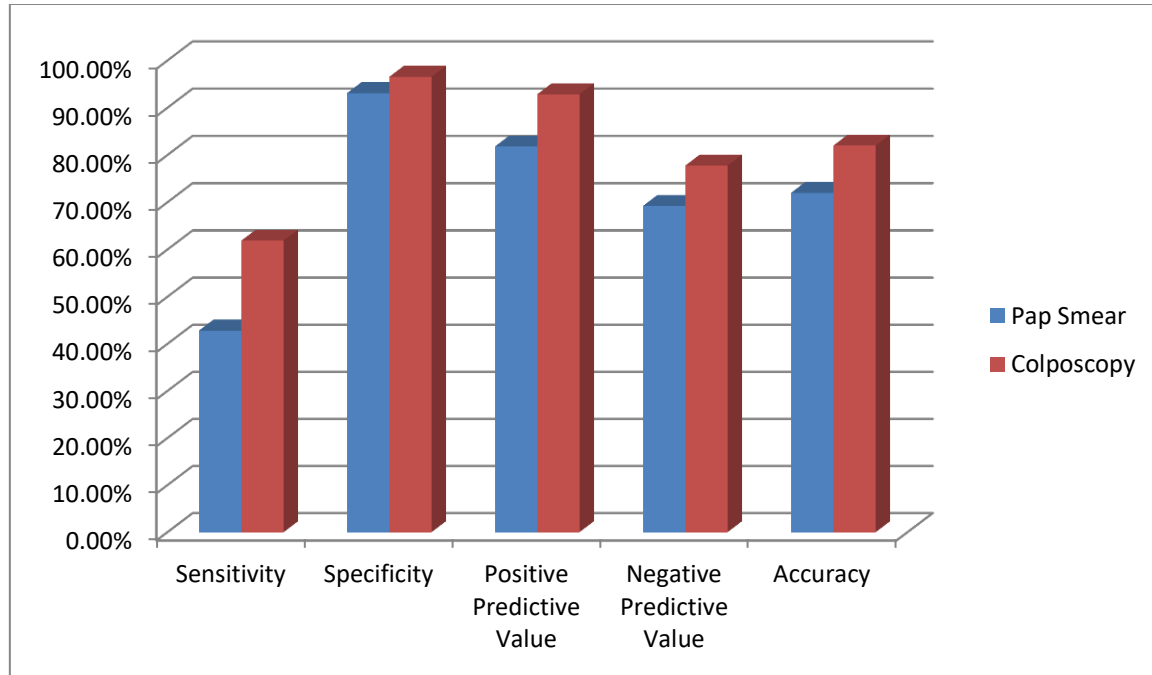
Sensitivity : 42.85%  
 Specificity : 93.10%  
 Positive Predictive Value : 81.81%  
 Negative Predictive Value : 69.23%  
 Accuracy : 72.00%

**Table 19:** Diagnostic Efficacy of Colposcopy

Colposcopy	Biopsy		Total
	Positive	Negative	
Positive	26	2	28
Negative	16	56	72
<b>Total</b>	<b>42</b>	<b>58</b>	<b>100</b>

Sensitivity : 61.90%  
 Specificity : 96.55%  
 Positive Predictive Value : 92.85%  
 Negative Predictive Value : 77.77%  
 Accuracy : 82.00%

**Graph 15:** Diagnostic Efficacy of Tests



**Table 20:** Diagnostic Efficacy of Tests

Diagnostic Efficacy	Pap Smear	Colposcopy
Sensitivity	42.85%	61.90%
Specificity	93.10%	96.55%
Positive Predictive Value	81.81%	92.85%
Negative Predictive Value	69.23%	77.77%
Accuracy	72.00%	82.00%

Colposcopy has higher sensitivity (61.90%) than that of Pap smear (42.85%). Specificity of Pap smear is (93.10%), that of colposcopy is 96.55%. The positive predictive value is comparable, 81.81% and 92.85%, for Pap smear and colposcopy respectively. The accuracy of colposcopy (82%) is higher than that of Pap smear (72%).

**Table 21:** False Negative Rate of Tests

Tests	False Negative Rate
Pap Smear	57.14%
Colposcopy	38.09%

Pap smear had false negative rate of 57.14% and colposcopy had false negative rate of 38.09%. Hence Pap smear had more chances of missing cervical neoplastic cases.

**Table 22:** False Positive Rate of Tests

Tests	False Positive Rate
Pap Smear	6.89%
Colposcopy	3.44%

False positive rate of Pap smear is 6.89% and colposcopy is 3.44% .



**Table 23:** Diagnostic Efficacy of Combined Cytology and Colposcopy

Diagnostic Efficacy	Pap Smear + Colposcopy
Sensitivity	77.50%
Specificity	87.09%
Positive Predictive Value	79.48%
Negative Predictive Value	85.71%
Accuracy	85.00%

Combining Pap Smear and colposcopy increases sensitivity to 77.50%, but decreases specificity to 87.09%, positive predictive value drops to 79.48%, negative predictive value raises to 85.71% and accuracy is 85%.

### Discussion

Invasive cervical cancer is considered preventable because of its prolonged preinvasive stage (CIN), which enables effective screening and treatment. Utilizing high-quality screening techniques with broad coverage and regular follow-ups can reduce cervical cancer cases by as much as 80%. Identifying and addressing the disease in its preclinical phase can result in a 100% survival rate.

Frequent cytology screening programs have significantly reduced the incidence and mortality of cervical cancer in developed countries.<sup>12,13,15,16</sup> However, in developing countries like India, cytology-based screening programs have had limited success due to the scarcity of trained personnel, inadequate laboratory facilities, lack of equipment, high costs and poor follow-up. Therefore, there is a pressing need to identify alternative screening methods with high sensitivity and specificity.

It is widely accepted that the process of carcinogenesis occurs primarily in preclinical stages that are invisible to the naked eye. However, colposcopy can detect these preclinical stages through magnified vision. When used alongside cytology, colposcopy can identify most smear-negative cases, enhancing the diagnostic accuracy of preclinical carcinoma. (Limburg, 1956; Naratil et al, 1957; Coppleson and Reid, 1976). Additionally, it can detect dysplastic lesions. Despite these benefits, the high cost and need for a trained operator are significant limitations.

In the present study, mild dysplasia (CIN -I), moderate to severe dysplasia (CIN – II/III) and invasive carcinoma accounted for 21 (50%), 17 (40-47%) and 4 (9.52%) of the total study group respectively. Similarly, Chakrabarty et al (1976)<sup>26</sup> found that mild dysplasia comprised 55.9% of cases, moderate to severe dysplasia 30.1% and invasive carcinoma 13.9%.

The highest incidence of unhealthy cervix cases was observed among women aged 31-40 years, accounting for 38% of the total cases. This observation was consistent with previous studies by Sunandabai et al (1968) and Bhojani K R (2011)<sup>12</sup>.

The current study findings indicate a chronological progression in age from CIN I (mean age 41.64) to CIN II/III (mean age 46.09) and then to invasive carcinoma (mean age 48). Similar progression over time has been observed by Meisels A et al (1969). Reagen et al (1955) reported a mean age of 34 years for dysplasia. Cyasselts et al (1969) found mean ages for CIN and invasive carcinoma to be 40.2 and 52.7 years respectively. Similar results were reported by Jeffcoat (1975).

The incidence of all neoplastic changes rises with parity. The majority of neoplastic changes are observed after parity 2 and above, consistent with the findings of Chakraborty et al (1976) and Rao et al (1973). Both Kushtagi P et al (2002) and Vaidya et al (2003) also reported a higher prevalence of CIN in women with a parity of more than 2 and more than 4 respectively. Similar study by A VijayNath J D et al (2015), CIN were high with increasing parity (>2).

The incidence of CIN (62.16%) and invasive carcinoma (75%) is notably higher among individuals from low socioeconomic backgrounds. This finding is consistent with the results reported by Vaidya et al (2003), Bhukhari M H et al (2012) and Di Saia et al (1985).

In this study, it was found that CIN and invasive carcinoma were more prevalent among illiterate women, with 56% of CIN and all cases of invasive carcinoma occurring among this group, consistent with findings of Sandhya (2009) (61%). The incidence of CIN I, CIN II/III and invasive carcinoma were 57.14%, 43.75% and 100% respectively among women who were married at less than 20 years of age. Similar findings were reported by Kushtagi et al (2002), Sherwani R K et al (2007), M S Bat et al (2012) and Shagun Rampuria, Nootan Chandwaskar et al (2023).

The pap smear results showed that 72% of the smears were inflammatory, while 22% were positive. A positive pap smear included findings of LSIL, HSIL, carcinoma in situ or invasive cancer. Among the 22 positive cases, there were 10 instances of LSIL and 12 of HSIL, with no malignancy detected. Inflammatory smear rates in previous studies include 54% by Ambiyee et al (1989), 65% by Jagoo Kumaran (1991) and 51% by Noor Afshan (1995). In this study, the overall incidence of CIN reported by Pap smear was 22%. Reporting by other authors include, 6.78% by Sholapurkar et al (1985), 3.5% by Sarangi et al (2004), 7.75% by Bhojani K R et al (2011)<sup>12</sup> and Bhukhari et al (2012).

In this study, 46 out of 100 women tested positive and 54 tested negative on VIA. Previous research indicates that VIA positivity ranges from 7% to 41% of cases (Jose J, 2004; Saira A S, 2003; Bhatla N, 2004).

In the present study, normal colposcopic findings were seen in 8% of cases. Inflammation, metaplasia and erosion were observed in 55%, LSIL in 8%, HSIL in 18%, unsatisfactory results in 9% and 2% were suspicious for malignancy. Kunippuswamy & Steele (2001) showed that

44.8% of cases had CIN, 30% had benign changes of the cervix and 25.5% were normal. It is comparable to the study of A Vijay, Nath J D, Deka N et al (2014), where colposcopy was able to pick 28% as pre malignant (CIN) whereas on colposcopically directed biopsy 36% cases were picked up as CIN and 14% were malignant.

In the present study, cervical biopsies were performed on all 100 cases. Of these, 7% were found to be normal and 51% showed cervicitis or metaplasia. Positive biopsy results were observed in 42 cases, with biopsies being considered positive if they revealed LSIL or higher. The positive biopsies included 21% mild dysplasia (LSIL/CIN 1), 17% moderate to severe dysplasia (HSIL/CIN 2/CIN 3) and 4% malignancies. Notably, none of the malignancies had visible growth on speculum examination. These findings are consistent with those of Young (1949), Kroli (1970), Shalini et al (1988).

Using histology as the diagnostic method, the sensitivity and specificity of the Pap smear were determined to be 42.85% and 93.10% respectively. The positive predictive value was 81.81%, while the false positive and false negative rates were 6.89% and 57.14% respectively. Various studies by different authors have shown differing accuracy rates for Pap smear reports. Karimi Zarchi et al reported a sensitivity/specificity of 70.9%/44.4%, Ashmita et al 90.24%/72.73%, Sukhpreet Singh et al 95%/63.75% and The Tata Memorial study reported sensitivities ranging from 64-99% and specificities ranging from 30-93%.

In this study, colposcopy demonstrated a sensitivity of 61.90% and a specificity of 96.55%. The positive predictive value was found to be 92.85%, with false positive and false negative rates of 3.44% and 38.09% respectively. Karimi Zarchi et al reported a sensitivity and specificity of 70.9% and 44.4%. Ashmita et al<sup>31</sup> and Sukhpreet Singh et al<sup>16</sup> reported sensitivity of 90.24%/specificity of 72.73% and sensitivity of 95%/specificity of 63.75% respectively. The Tata

Memorial study showed a wide range of sensitivity (64-99%) and specificity (30-93%).

In the present study, colposcopy had higher sensitivity (61.90%) than that of Pap smear (42.85%). Specificity of Pap smear was 93.10%, that of colposcopy 96.55%. The positive predictive value is comparable, 81.81% and 92.85% for Pap smear and colposcopy respectively. The accuracy of colposcopy (82%) is higher than that of Pap smear (72%). Combining Pap smear and colposcopy increases the sensitivity to 77.5%, but decreases the specificity to 87.09%.<sup>22,23,24,27,30,31</sup> Positive predictive value drops to 79.48%, negative predictive value rises to 85.71% and accuracy is 85%. Similar results were reported by Pete et al (1998), Massad and Collins (2001)<sup>18</sup>, Benedict et al (2004), TehranianA et al (2009), Pimple S A et al (2010)<sup>22</sup>. The sensitivity and specificity of cervical cytology in detecting cervical cancer were 70.8% and 84.2% respectively. For colposcopy in detecting CIN, the sensitivity was 100% and the specificity was 51.9%. MertUlasBarut et al (2015) conducted a study "Analysis of Sensitivity, Specificity and Positive and Negative Predictive Values of Smear and Colposcopy in the Diagnosis of Premalignant and Malignant Cervical Lesions." They found cytology to have a sensitivity of 57% and specificity of 76%. Colposcopy in detecting CIN had a sensitivity of 92% and specificity of 67%.

### Conclusion

The easy accessibility of the cervix for inspection, palpation and cytology in tissue sampling procedures has facilitated extensive screening programs for the early detection and treatment of cervical diseases. This has significantly contributed to the remarkable reduction in mortality from cervical carcinoma. Cervical cytology, though less accurate in detecting abnormalities, is a very valuable procedure. It avoids the need for expert handling and maintenance of a sophisticated and costly instrument like the colposcope. It efficiently

narrows down the suspicious group of patients who may require further specialized investigations. Its role in mass screening procedure is immense. Colposcopy is an invaluable procedure, as its real value lies in pinpointing the most suspicious area for a targeted biopsy.<sup>18,19,20,21</sup> There is a need to encourage the sequential use of Pap smear and colposcopy, along with colposcopy-directed biopsy, which remains the gold standard for early detection and management of CIN. Colposcopy is valuable in identifying both premalignant and malignant lesions of the cervix. When combined with cytology, the likelihood of detecting squamous intraepithelial lesions or malignancy in patients with cervical abnormalities significantly increases compared to using either procedure alone.

**Ethical Approval:** The study was approved by the Institutional Ethics Committee.

### References

1. Pati S, Patil, Solanke P. Cytological screening for early diagnosis of cervical intraepithelial neoplasia (CIN) and early carcinoma of cervix. *Int Sci Publ* 2015; 5-1-6.
2. Farooqui H H, Zodpey S. Cervical cancer control in India : Taking evidence to action. *J Public Health Policy*. 2012; 33(2): 165-72.
3. Krishnan S, Madson E, Porterfield D, Varghese B. Advancing cervical cancer prevention in India : Insights from research and programs; 2013.
4. Srinivasan S, Johari V, Jesani A. Cervical cancer screening in India. *Ethics dumping*. Berlin:Springer; 2018. P.33e48.
5. Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem. World Health Organization; Geneva Switzerland: 2021.
6. Kholi B, Arya B S. Comparison of Pap smear and colposcopy in detection of

- pre-malignant lesions of cervix. J South Asian Fed Menopause SOC 2014;2:5-8.
7. Khan M J, Werner C, Darragh T M et al. ASCCP colposcopy standards : Role of colposcopy, benefits, potential harms and terminology for colposcopic practice. J Low Genital Tract 2017.
  8. Choudhury R D, Inamdar S A, Hari Haran C. Correlation of diagnostic efficacy of unhealthy cervix by cytology, colposcopy and histopathology in women of rural area. Int J Reprod Contracept Gynecol 2014;3:213-18.
  9. Lynge E, Rygaard C, Baillet MV P et al. Cervical cancer screening at crossroads. APMIS 2014;122:667-73.
  10. Hegde D, Shetty H, Shetty P K, Rai S. Diagnostic value of acetic acid comparing with conventional pap smear in the detection of colposcopic biopsy-proved CIN. J Cancer Res Ther. 2011 Oct-Dec;7(4):454-8.
  11. Misra J S, Srivastava S, Singh U, Srivastava A N. Risk factors and strategies for control of carcinoma cervix in India : Hospital based cytological screening experience of 35 years. Indian J Cancer 2009;46:55-9.
  12. Bhojani K R, Garg R. Cytopathological study of cervical smears and correlation of findings with risk factors. Int J Biol Med Res.2011;2(3):757-761.
  13. H S Cronje. Screening for cervical cancer in developing countries. International Journal of Gynecol & Obstet 2004;84(2):101-108.
  14. Goel A, Gandhi G, Batra S, Bhambani S, Zutshi V, Sachdeva P. Visual Inspection of the cervix with acetic acid for cervical intraepithelial lesions. International Journal of Gynecol & Obstet 2005; (88):25-30.
  15. Usha B Saraiya. Cytology and Colposcopy in Screening for Cervical Cancer. Recent advances in Obstet and Gynecol 2001;(5):196-197.
  16. Sukhpreet L S, Nayana A D, Murari S N. A comparison of Colposcopy and Papanicolaou Smear : Sensitivity, Specificity and Predictive Value. Bombay Hospital Journal- Origin/Research Articles 2009.
  17. Marana H R, Andrade J M, Duarte G, Matthes A C, Taborda M F, Bighetti S. Colposcopic scoring system for biopsy decisions in different patient groups. Eur J Gynaecol Oncol 2000;21(4):368-370.
  18. Massad L S, Collins Y C. Strength of correlation between colposcopic impression and biopsy history. Springfield: Southern Illinois University.2001;14:11.
  19. Mousavi AS, Fakour F, Gilani MM, Ghaemmaghami F, Karimi ZM, A Prospective Study to Evaluate the Correlation between the Ried Colposcopic Index Impression and Biopsy Histology. Journal of lower Genital Tract Disease. 2007;11(3):147-150.
  20. Tamiolakis D, Kalloniatiou M, Lambropoulou M, Kambanieris M, Tsopeles A, Daskalakis G. Contribution of combined colposcopy and cytology in cervical pathology. Arch Gynecol Obstet. 2005;273(1):39-42.
  21. Cantor S B, Cardenas-Turanzas M, Cox D D, Atkinson E N, Noguera-Gonzalez G M, Beck J R et al. Accuracy of colposcopy in the diagnostic setting compared with the screening setting. Obstet Gynecol .2008;111(1):7-14.
  22. Pimple S A, Amin G, Goswami S, Shastri. Evaluation of Colposcopy Vs Cytology as secondary test to triage women found positive on visual inspection test. Indian J Cancer (serial online).2010;47:308-313.
  23. Ahuja Bhalerao, Sayali Kulkarni, Sunita Ghike, Anjali Kaethalkar, Sulabha Joshi.

- Correlation of pap smear, colposcopy and histopathology in women with unhealthy cervix. *J South Asian Feder Obst Gynaec* 2012;4(2):97-98.
24. S Chhabra, K Saharan, D Srujana. Diagnosis of Cervical Precancer/Cancer and Staging. *International J of Gynecol and Obstet India*. 2013;250-253.
25. The 2019 ASCCP Risk-based Management Consensus Guidelines for Abnormal Cervical Cancer Screening Tests and Cancer Precursor and Beyond.
26. Chakrabarty B N, Poddar D L, Sarkar S K, Das N. Early detection of cervical cancer. *J Obstet Gynecol India*. 1976;26:870.
27. Tuon F F, Bittencourt M S, Panichi M A, Pinto A P. Sensitivity and specificity of cytology and colposcopy exams with the histological evaluation of cervical intraepithelial lesions. *Rev Assoc Med Bras* 2002; 48(2);140-4.
28. Jain V, Vyas A S,. Cervical neoplasia cyto-histological correlation (Bethesda System) . A study of 276 cases. *J Cytol Histol* 2010;1:106.
29. Manjit Singh Bat, Rishu Goel, Anil Kumar Sun, Majit Kumar Mohi. Detection of abnormal cervical cytology in papanicolaou smears. *J Cytol* 2012;29(1):45-47.
30. S Sharma, M Saini, Saini A, Bhalla A A. Colposcopic Evaluation Of Patients With Abnormal Cervical Cytology And It's Histopathological Correlation – An Original Article. *The Internet Journal of Gynaecology and Obstetrics*. 2014 Volume 18 Number 1.
31. D Ashmita, Shakuntala P N, Shubha R Rao, S K Sharma and Geetanjali S. “Comparison and Correlation of Pap smear, colposcopy and histopathology in symptomatic women and suspicious looking cervix in a tertiary hospital care center. *IJHSR*; 2013;3(5):50-59.
32. Malur P R, Desai B R, Dala Anita, Durdi Geeta, Sherigar Bhavana, Gupta Pallac. Sequential screening with cytology and colposcopy in detection of cervical neoplasia. *Journal of South Asian Federation of Obstetrics and Gynaecology*. 2009;September-December:1(3)45-48.
33. Sherwani R K, Khan T. Conventional pap smear and liquid based cytology for cervical cancer screening. *J Cytol*. 2007;2(4):167-72.