

STUDY OF CERVICAL PAP SMEAR IN A TERTIARY CARE HOSPITAL OF BHARUCH, GUJARAT

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ABSTRACT

Background: Cervical cancer continues to be one of the causes of morbidity and mortality in women in the developing countries and prevention of this burden depends on the early diagnosis which must be done through cervical Pap smear screening. This research was done to assess the range of cytology in cervical Pap smears in one of the tertiary care hospitals of Bharuch, Gujarat. **Materials and Methods:** The study conducted was a retrospective observational study which includes patients who visited gynecology department and whose pap smear sample was taken during the two year period from January 2024 to December 2025.

Result: Study involved 1250 samples of cervical Pap smear samples of women who visited the gynecology outpatient department and the samples were analyzed and grouped using the Bethesda System 2014. Out of the total samples examined 78.4% were negative intraepithelial lesion or malignancy (NILM), inflammatory smears were observed in 8.8% of cases, low-grade squamous intraepithelial lesion (LSIL) was showed in 5.6% of cases, high-grade squamous intraepithelial lesion (HSIL) was exhibited in 2.9% of cases, atypical squamous cells of undetermined significance (ASCUS) was observed in 1.1% of the cases and squamous cell carcinoma (SCC) was 0.6%. There are unsatisfactory smears also present which is 2.6% of total cases. The last and most common occurrence of abnormalities in the epithelial cells was found in the age group of 41 years and 50 years. Multiparity, low socioeconomic status, and early age at first coitus were found to be of significant association to abnormal cytological findings. **Conclusion:** The research finds that regular screening of cervical Pap smear is an inexpensive, easy and effective method of early detection of the premalignant and malignant lesions of the cervix, and its practice should be reinforced, especially in the rural and semi-urban areas of Gujarat.

INTRODUCTION

Cervical cancer is the fourth most prevalent form of malignancy among women in the world and poses a significant health issue with special reference to the low- and middle-income nations where systematic screening measures have either not been established or poorly imposed.^[1] In 2020, the world was estimated to have around 604,000 cases of cervical cancer every year and 342,000 deaths, and most of the overload was in the sub-Saharan Africa and South Asia.^[2] Cervical cancer in India is the most widespread cancer in women and it brings almost one-fourth of the total cervical cancer burden worldwide.^[3] Lack of awareness, inadequate access to screening facilities, and poor healthcare facilities in the rural and semi-urban areas are considered to be major causes of the incidence and mortality in the Indian subcontinent.^[4]

One of the best and most effective screening modalities that has been in use since 1941 by George Papanicolaou to detect early signs of precancerous and cancerous lesions of the uterine cervix is the Papanicolaou (Pap) smear test.^[5] With the introduction of cervical cytology as a screening method, the number of cases and deaths due to cervical cancer in developed countries has reduced significantly over the last few decades.^[6] Pap smear allows detection of abnormal cells at a premalignant stage; thus, making it easier to intervene on time and significantly enhance the patient outcomes.^[7] The Bethesda system, which was first introduced in 1988 and has been updated in 2001 and 2014, is a standardized system of reporting cervical cytology outcomes, and has become the predominant classification system in the world.^[8] This system classifies the results as negative intraepithelial lesion or malignancy (NILM), abnormalities of epithelial cells, such as atypical squamous cells of undetermined significance (ASC-US), low-grade

squamous intraepithelial lesion (LSIL), high-grade squamous intraepithelial lesion (HSIL), and squamous cell carcinoma (SCC), and so on.^[9]

Previous studies have shown that different parts of India report varying prevalence rates of cervical epithelial abnormalities, which have demonstrated the heterogeneity of diverse population in demographics, reproductive health and access to healthcare facilities.^[10] A study carried out in Western India has shown that the percentage of epithelial cell abnormality is between 2.5% and 12.6% depending on the population of the study and the geographical location.^[11] Relatively higher prevalence of inflammatory smears and infections in women of lower socioeconomic status has been reported in studies conducted in South India.^[12] Moreover, studies in North India have revealed the linkages between multiparity, early marriage, poor genital concerns, and high susceptibility to cervical dysplasia.^[13]

Even though Pap smear test is easily accessible and simple, the coverage of cervical cancer screening in India remains low at less than 3 percent of the target population.^[14] This is especially worrisome in the state like Gujarat where the majority of population is rural and the number of specialized healthcare facilities to access is minimal.^[15] Bharuch district in South Gujarat is featured by a mixture of urban and rural population and a high number of tribal population, where little data are known about the trend of cervical cytological abnormalities in this area.^[16]

The majority of the past research of Gujarat concentrated on tertiary care units of big cities like Ahmedabad and Surat, the gaps in research are apparent.^[17] Knowledge of the local epidemiology trends of cervical pathology is vital in ensuring that specific screening methods are developed as well as proper distribution and allocation of health resources are established.^[18]

The purpose behind the present research was thus to assess the range of cytological results in cervical Pap smear tests done in a tertiary care hospital in Bharuch, Gujarat as well as to determine the relationship between different demographic and reproductive variables and abnormal cervical cytology. The results of this research should be compared to the current body of knowledge and will aid in the creation of region-related approaches to cervical cancer screening.

MATERIALS AND METHODS

Study Design and Setting: This was a retrospective observational study that was carried out in the Department of Pathology along with the Department of Obstetrics and Gynecology in a tertiary care hospital, Bharuch district, Gujarat, India. The research data was collected retrospectively from January 2024 to December 2025.

Population and Size of sample of the study: The analysis involved 1,250 cervical Pap smear samples of women who were visiting the gynecology outpatient department within the period of the study. The sample size was selected according to the number of Pap smears that were received in the course of the study which was deemed to be sufficient to meet the aims of the research.

Inclusion Criteria

The study included women aged 21 years and older who reported to the gynecology outpatient department with issues like vaginal discharge, irregular menstrual bleeding, postcoital bleeding, postmenopausal bleeding or women who had come to the department to undergo a routine screening of cervical cancer.

Exclusion Criteria

The women who were pregnant during examination, had undergone total hysterectomy, had active vaginal bleeding at the time of sample collection, had taken vaginal medications or douching within 48 hours before examination and women with previously diagnosed and treated cervical malignancies were excluded in the study.

Sample Collection and Processing: Sample collection and processing usually involve a multi-stage process that includes primary sample collection, sorting, processing, preservation, and storage.

The traditional approach was used to get Cervical Pap smear samples. Patient's informed consent was received, then positioned under the lithotomy position and the cervix observed utilizing a Cusco bivalve speculum. Ayre spatula was used to collect samples of the ectocervix with 360° rotation and a cytobrush was used to collect endocervical samples. The acquired material was immediately smeared on clean glass slides and they were fixed by putting them in 95% ethyl alcohol and hence stained by Papanicolaou staining procedure.

Cytological Reporting: The results of all the stained smears were analyzed by the experienced cytopathologists, and the results were reported as per the 2014 Bethesda System of cervical cytology reporting. Adequacy of the specimen was determined, and the smears were rated as satisfactory or unsatisfactory to carry out the evaluation. Good smears were further categorised into the following categories: negative intraepithelial lesion or malignancy (NILM), epithelial cell abnormalities (ASC-US, ASC-H, LSIL, HSIL and SCC) and glandular cell abnormalities.

Data Collection: Current demographic and clinical factors such as age, parity, age at first coitus, socioeconomic status (according to the modified Kuppuswamy scale), presenting complaints, contraceptive use and menstrual history were obtained from hospital records and outpatient department registers.

Statistical Analysis: The data input and analysis was done with the help of Statistical Package of Social Sciences (SPSS) 25.0 (IBM Corp., Armonk, NY,

USA). Proper usage of descriptive statistics was in the form of frequencies, percentages, and mean standard deviation. The Chi-square test was used to compare categorical variables and p-value lesser than 0.05 was regarded as significant.

RESULTS

A total of 1,250 cervical Pap smear samples were analyzed during the study period. The mean age of the study participants was 38.6 ± 9.4 years, with a range of 21 to 72 years. The majority of women belonged to the age group of 31–40 years (34.6%), followed by 41–50 years (27.9%). Most participants were multiparous (73.8%), hailed from rural areas (58.4%), and belonged to lower socioeconomic strata (45.4%). The most common presenting complaint was vaginal discharge (46.3%), followed by irregular

menstrual bleeding (22.5%), lower abdominal pain (14.8%), postmenopausal bleeding (8.2%), and postcoital bleeding (5.4%). A small proportion (2.8%) presented for routine screening without specific complaints.

Among the 1,250 samples, 1,217 (97.4%) were satisfactory for evaluation, while 33 (2.6%) were reported as unsatisfactory due to scant cellularity, obscuring blood, or excessive inflammation. Among the satisfactory smears, 980 (78.4%) were reported as negative for intraepithelial lesion or malignancy. Inflammatory smears constituted 110 (8.8%) cases. Epithelial cell abnormalities were detected in 127 (10.2%) cases, comprising 14 (1.1%) cases of ASC-US, 70 (5.6%) cases of LSIL, 36 (2.9%) cases of HSIL, and 7 (0.6%) cases of SCC. The distribution of cytological findings is presented in [Table 1 and Figure 1].

Table 1: Distribution of Cytological Findings According to the Bethesda System (N = 1,250)

Cytological Category	Number of Cases (n)	Percentage (%)
Unsatisfactory smear	33	2.6
NILM	980	78.4
Inflammatory smear	110	8.8
ASC-US	14	1.1
LSIL	70	5.6
HSIL	36	2.9
Squamous cell carcinoma	7	0.6
Total	1,250	100.0

NILM: Negative for Intraepithelial Lesion or Malignancy; ASC-US: Atypical Squamous Cells of Undetermined Significance; LSIL: Low-grade Squamous Intraepithelial Lesion; HSIL: High-grade Squamous Intraepithelial Lesion.

The age-wise distribution of epithelial cell abnormalities revealed that the highest prevalence was observed in the 41–50 year age group, where 52 out of 340 women (15.3%) showed abnormal

findings. This was followed by the 51–60 year age group (12.8%) and the 31–40 year age group (8.3%). The distribution is shown in [Table 2, Figure 2 and 3].

Table 2: Age-wise Distribution of Epithelial Cell Abnormalities (N = 1,217 satisfactory smears)

Age Group (years)	Total Smears (n)	Normal/NILM + Inflammatory (n)	Epithelial Cell Abnormalities (n)	Percentage of Abnormalities (%)
21–30	228	217	11	4.8
31–40	421	386	35	8.3
41–50	340	288	52	15.3
51–60	164	143	21	12.8
>60	64	56	8	12.5
Total	1,217	1,090	127	10.4

Chi-square = 18.74; $p < 0.001$

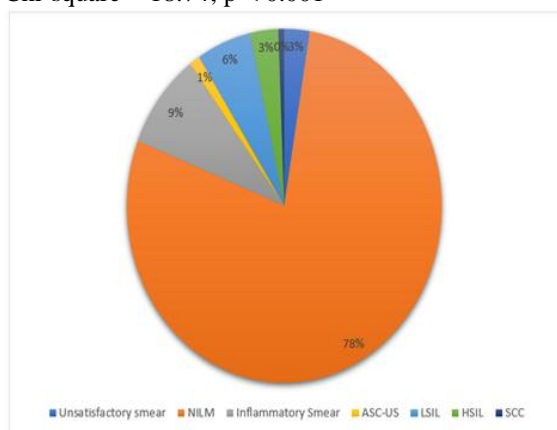


Figure 1: Distribution of Cytological Findings According to the Bethesda System

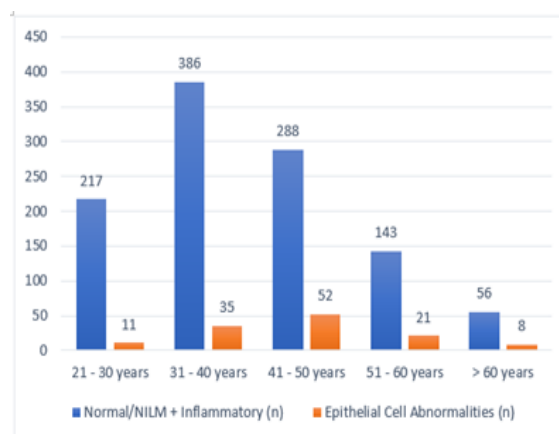


Figure 2: Age-wise Distribution of Epithelial Cell Abnormalities

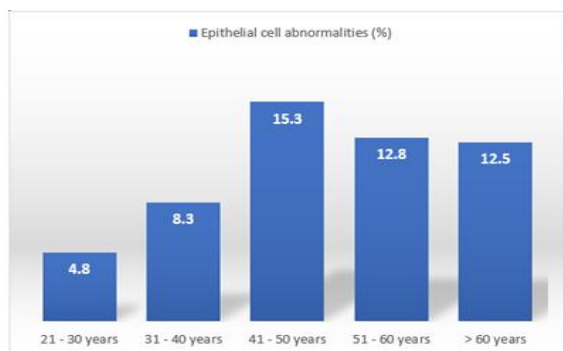


Figure 3: Age-wise Distribution of Epithelial Cell Abnormalities (%)

The association of various demographic and reproductive factors with epithelial cell abnormalities was analyzed and is presented in Table 3. Multiparity (≥ 3 births) was significantly associated with epithelial cell abnormalities ($p < 0.001$). Women with age at first coitus ≤ 18 years had a significantly higher prevalence of abnormal findings compared to those with first coitus after 18 years (14.2% vs. 6.8%; $p < 0.001$). Lower socioeconomic status was also significantly associated with abnormal cytological findings ($p = 0.003$). No statistically significant association was found with the type of contraception used ($p = 0.214$).

Table 3: Association of Demographic and Reproductive Factors with Epithelial Cell Abnormalities

Variable	Category	Total (n)	Abnormal Cytology (n)	Percentage (%)	p-value
Parity	Nulliparous/ Para 1-2	319	18	5.6	<0.001
	Para ≥ 3	898	109	12.1	
Age at first coitus	≤ 18 years	592	84	14.2	<0.001
	> 18 years	625	43	6.8	
Socioeconomic status	Upper/Upper-middle	234	14	6.0	0.003
	Lower-middle	430	42	9.8	
	Lower	553	71	12.8	
Residence	Urban	506	39	7.7	0.016
	Rural	711	88	12.4	
Contraceptive use	Barrier	284	24	8.5	0.214
	Oral/Injectable	198	22	11.1	
	None	735	81	11.0	

Among the 110 inflammatory smears, specific organisms were identified in 62 cases (56.4%). Bacterial vaginosis was the most common infection identified (24 cases, 21.8%), followed by *Candida* species (19 cases, 17.3%), *Trichomonas vaginalis* (12 cases, 10.9%), and findings suggestive of Human Papillomavirus (HPV) cytopathic effect, namely koilocytic changes, in 7 cases (6.4%).

Among the seven cases reported as squamous cell carcinoma on cytology, the mean age was 52.3 ± 8.1 years. Six of these seven patients were grand multiparous, and five had first coitus at or before 18 years of age. All seven cases were referred for colposcopy-directed biopsy for histopathological confirmation.

DISCUSSION

The current study will present an overall analysis of cytological spectrum of cervical Pap smear results of a tertiary care hospital and serving the population of Bharuch district, South Gujarat. The results of this study indicate the current trends of cervical pathology when there is a high semi-urban and rural population with no previous experience with systematic cervical cancer screening programs.

The general rate of epithelial cell abnormalities in this research was 10.4% which tallied with the results of various tertiary care facilities in India. In one study that was done at a tertiary care hospital in central India, an epithelial abnormality rate was 8.7% which is similar to the current research findings.^[19] This prevalence, is however higher than the prevalence of 3.2% of a large population-based screening program

in southern India where the study population was mostly asymptomatic.^[20] The somewhat increase prevalence in the current research can be explained by the fact that most of the women presented with the issue of gynecological complaints and not to get a routine screening procedure, thereby creating a selection bias among those that were symptomatic.

The LSIL (5.6%) and HSIL (2.9%) abnormality of epithelial cells were the most prevalent and ASC-US (1.1%) and SCC (0.6%) were the least prevalent in this study. These results largely coincide with the distribution pattern that is presented in the other Indian studies.^[21] A similar study carried out in a medical college in western India also revealed LSIL as the most common epithelial abnormality with 4.8% of all Pap smears of the smears tested.^[22] The number of LSIL over HSIL indicates that a significant percentage of cervical neoplasias is being caught at an early and possibly reversible stage and this underlines the significance of screening to curb the occurrence of invasive carcinoma.

The incidence of HSIL in the present study (2.9%), is worthy of note and needs attention since these lesions pose a high risk to develop into invasive cervical cancer in case they are not treated. Results of a multicentric study in Indian hospitals have shown that the prevalence of HSIL was between 1.2% and 3.8% with more prevalence in the populations with limited access to screening services.^[23] The current results are within this trend and indicate that there should be an improvement in screening coverage in the Bharuch district.

In this study, the unsatisfactory proportion of smear rate was 2.6%, which is acceptable because it is less

than 5 percent as advised by the international guidelines.^[24] A poor rate of less than 5 percent signifies satisfactory collection method of the sample and satisfactory laboratory processing methods. Other Indian centers have reported dismal rates of 1.5 to 8.3 percent, and higher rates have been frequently reported because of the lack of training of healthcare staff in sample collection.^[25]

The age-matched study showed that the most prevalence of epithelial cell abnormalities was found in the 41-50 years age group (15.3%), which is again in line with the well-established natural history of cervical neoplasia, in which HPV infection commonly happens in younger females, but progresses to significant dysplasia and carcinoma over a period of one to two decades.^[26] This result is consistent with those observed in a big hospital-based trial in the eastern region of India, with women in the fifth decade demonstrating the greatest concentration of cervical epithelial abnormalities.^[27] The result supports the suggestion that screening in which women older than 30 years are especially targeted should be implemented in resource-constrained environments where a universal approach to screening is not possible.

The high correlation between multiparity and abnormal cervical epithelia that were found in this study ($p < 0.001$) is highly reported in the literature. The high parity has been identified as a risk factor (independent) in cervical cancer because of the recurrent cervical trauma during birth, the hormones and exposure to HPV, which is heightened by the immunosuppressive effect of pregnancy.^[28] A meta-analysis and systematic review published in one of the most reputable epidemiology journals proved that women who had seven or more full-term pregnancies were at a four-fold risk of developing squamous cell carcinoma of the cervix than women who had never delivered their first child.^[29]

In the current study, the abnormal cytological findings were highly related to early age at the first sexual intercourse (≤ 18 years) ($p < 0.001$). This relationship is biologically possible because the immature cervical epithelium in younger women is more vulnerable to HPV infection and consequent neoplastic transformation.^[30] The cervical area of the adolescent cervix is especially susceptible to carcinogenic assault and early exposure to HPV at this stage of life holds significant importance in terms of risking the development of cervical intraepithelial neoplasia throughout life.^[31]

Reduced socioeconomic status was also observed to be highly linked with epithelial cell abnormalities ($p = 0.003$). This observation is a manifestation of the established correlation between poverty, low health literacy, low levels of genital hygiene, weak access to health care services and high susceptibility to cervical pathology.^[32] Women of lower socioeconomic have fewer opportunities to attend screening programs and often present at advanced disease stages. A rural Indian population-based study showed that women in the lower social economic classes were three times

more likely to develop cervical abnormalities than women in the higher social economic classes.^[33]

The existing disparity in the rates of abnormalities between rural and urban inhabitants (12.4% vs. 7.7%; $p = 0.016$) in the present study is alarming and demonstrates the gap in the access to healthcare and literacy levels of these groups. Gujarat rural women have several barriers to screening for cervical cancer such as remote location, cultural taboos, unavailable female healthcare workers, and poor knowledge about the essence of preventive health practices.^[34]

Infections in inflammatory smears, most of which is caused by bacterial vaginosis, then *Candida* species and *Trichomonas vaginalis*, are also in line with the trend reported in various Indian studies.^[35] Although these infections are non-targeted in the cervical carcinogenesis, they suggest that the burden of reproductive tract infections among the study population was high and gives a window of opportunity to treat these infections during screening visits.

It is especially important that the observations of the koilocytic changes that are indicative of HPV infection can be made in 6.4% of inflammatory smears, considering the well-known causal relationship between long-term high-risk HPV infection and cervical cancer.^[36] Even though the standard Pap smear is not as sensitive as molecular HPV testing in detecting HPV-related alterations, the detection of koilocytosis is a valuable cytological basis that needs to be further developed.^[37]

The current research has some weaknesses that are worth consideration. The study is a retrospective study based in the hospital, so the results cannot be applied to the whole population of the Bharuch district. Although the conventional Pap smear technique is cost-effective, it is less sensitive when compared to liquid-based cytology. Moreover, not all of the cases with cytological abnormalities could be matched by histopathology; thus, it restricts the measurement of diagnostic efficacy. Despite these limitations, the study offers data of great baseline on the cervical cytological patterns within this described region.

CONCLUSION

This current research shows that the abnormalities in cervical epithelial cells make a considerable percentage of Pap smear results in women who visit the tertiary care hospital in Bharuch, Gujarat with a general prevalence of 10.4%. The prevalent abnormality was low-grade squamous intraepithelial lesion and then high-grade squamous intraepithelial lesion. The highest prevalence of abnormalities of epithelial cells was observed among women aged 41-50 years. The high factors that were found to be linked with the abnormal cervical cytology were multiparity, early age at first coitus, low socioeconomic status, and rural residence. This research study supports the importance of the Pap

smear as a low cost, simple, and efficient screening method in the early diagnosis of premalignant and cancerous cervical lesions. The necessity of the strengthening of cervical cancer screening programs in semi-urban and rural Gujarat, with a special focus on educating women on the relevance of regular screening, considerations of high-risk categories, and Pap smear screening as a part of routine gynecology was urgent. The screening of the community, training of the paramedical personnel on collecting samples, and creating pathways through which the women with abnormal results can be referred is necessary steps towards curbing the burden of cervical cancer in this region.

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