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Original Research Article

Prevalence of abnormal Pap smear in pregnant women

Kakoli Nikhil Banerjee, Poonam Rani, Mukul Chandra, Fayaz Khan H.*

Department of Obstetrics and Gynecology, F. H. Medical College and Hospital, Agra, Uttar Pradesh, India

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***Correspondence:**
Dr. Fayaz Khan H.,
E-mail: khanhdrfayaz@gmail.com

ABSTRACT

Background: Cervical cancer is a leading cause of morbidity and mortality among women, particularly in low-resource settings. Pregnancy presents an opportunity for early cervical screening, yet routine screening programs remain inadequate. This study aims to determine the prevalence of abnormal Pap smears in pregnant women and assess the association of abnormal findings with age and clinicodemographic characteristics.
Methods: This cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, F.H. Medical College and Hospital, Agra. A total of 197 pregnant women undergoing routine antenatal Pap smear screening were enrolled. Cytological evaluation was performed using the Bethesda classification system. Statistical analysis was conducted using SPSS version 26, with chi-square tests applied to determine associations between variables.
Results: Among 197 participants, 73.1% had normal or inflammatory smears, while 26.9% had varying degrees of epithelial abnormalities. The prevalence of ASCUS, Low SIL and High SIL were 10.7%, 8.6% and 7.6%, respectively. No cases of squamous cell carcinoma were identified. Women aged 30-40 years exhibited the highest proportion of abnormal Pap smears (49%). Rural residence, lower socioeconomic status and multiparity were associated with increased prevalence of abnormal cytology, though age was not statistically significant as a risk factor.
Conclusions: The study highlights a significant proportion of abnormal Pap smears among pregnant women, underscoring the importance of integrating cervical cancer screening into routine antenatal care. Awareness programs, early HPV vaccination and improved access to gynecological services are essential strategies for reducing the burden of cervical cancer in pregnant populations.

Keywords: Abnormal cytology, Antenatal care, Bethesda system, Cervical cancer screening, Pap smear, Pregnancy

INTRODUCTION

Cervical cancer remains a significant public health issue, particularly in low- and middle-income countries, where it is the leading cause of cancer-related deaths among women. With an alarmingly high prevalence of 22-26.[2] cases per lakh women and 147 fatalities per lakh women, cervical cancer is the most common malignancy among women in certain nations.[1,2]

In these countries, women from low socioeconomic backgrounds often lack awareness about cervical cancer and screening facilities. Even when aware, societal stigmas prevent many from seeking screening. Most women tend to visit healthcare providers only when symptoms of the disease appear. Studies have shown that the early detection of pre-invasive lesions through cytology could significantly downstage cervical cancer, offering a crucial opportunity during the antenatal phase, as abnormal Pap smears have also been linked to adverse pregnancy outcomes such as preterm labor.[3,4]

Cervical cancer is one of the most prevalent malignancies globally, with 604,127 new cases reported in 2020 and 15% of new cases among women originating from Southeast Asia.[1] In Malaysia, cervical cancer is the third most common cancer among women, with an age-standardized rate (ASR) of 9.8 for Chinese females,

followed by 7.6 for Indians and 5.1 for Malays.[2] Despite the implementation of a national cervical cancer screening program, the uptake remains low, with coverage at around 40% according to recent surveys.[5] While HPV vaccination rates have been high since 2010, the uptake of Pap smear screening remains disappointing.[6] Abnormal Pap smears during pregnancy occur in approximately 1.6% to 9.5% of pregnancies, with a similar prevalence to age-matched non-pregnant women.[7,8] Studies have shown that routine antenatal care presents an opportunity for cervical cancer screening and women who seek prenatal care have a higher likelihood of receiving a diagnosis of abnormal cytology.[9,10]

While pregnancy can alter cervical cell activity due to hormonal fluctuations, making screening more complex, cervical cytology during pregnancy is still considered reliable, particularly if the woman is at high risk.[4] Many developed countries have integrated cervical cancer screening into prenatal care, offering a model for resource-limited countries like India, where screening programs are insufficient.

This study aims to determine the prevalence of abnormal Pap smears in pregnant women and explore associated risk factors. By identifying cervical abnormalities early, the research seeks to improve maternal health outcomes and contribute to the development of routine cervical cancer screening during antenatal visits, ultimately reducing cervical cancer-related morbidity and mortality.

METHODS

This cross-sectional study was conducted over a period of 18 months (30/6/2023 to 30/3/2025) in the Department of Obstetrics and Gynaecology at F.H. Medical College and Hospital, Etmadpur, Agra. A total of 197 pregnant women undergoing routine antenatal care were enrolled after obtaining ethical clearance and informed written consent. The study population included pregnant women who underwent Pap smear testing as part of their clinical evaluation.

Women were included if they were pregnant and consented to Pap smear examination. Exclusion criteria comprised women with a history of threatened abortion in the current pregnancy, recent sexual intercourse, vaginal examination or medication within the preceding 48 hours, presence of per vaginal bleeding, preterm premature rupture of membranes, preterm labor or obvious cervical dilatation on speculum examination. Women who were unwilling to undergo Pap smear were also excluded.

Relevant demographic and clinical data were collected using a pre-designed proforma. Pap smear was performed with the patient in the dorsal lithotomy position. After inserting Cusco's speculum, the cervix was visualized and exfoliated cells were collected from the squamocolumnar junction using an Ayre's spatula for the ectocervix and a cytobrush for the endocervix with a 360° rotation. The collected material was evenly smeared on a clean glass slide, immediately fixed with 95% ethyl alcohol for 30 minutes and stained using the Papanicolaou staining technique. The cytological findings were interpreted and reported according to the Bethesda Classification System 2001. Results were categorized as follows: Group I–normal smears or inflammatory changes; Group II–atypical squamous cells of undetermined significance (ASC-US); Group III–low-grade squamous intraepithelial lesion (LSIL) and Group IV–squamous cell carcinoma.

Statistical analysis

Data was entered in Microsoft Excel and analysed using statistical software SPSS version 26 (SPSS Inc., Chicago, IL, USA). The continuous variables were evaluated by mean (standard deviation) value when required. The dichotomous variables were presented in number/frequency and were analysed using the Chi-square test. P values<0.05 will be considered statistically significant.

RESULTS

The study analyzed 197 pregnant women undergoing Pap smear screening. Among them 144 had normal Pap smear, while 53 had abnormal smear. Most normal results (60.4%) occurred in women aged 20-30, while abnormal results peaked in 30-40 years old (49.0%), though age showed no significant association. Rural women had higher abnormal rates (67.9%) than urban (32.1%), but not significantly.

BMI distribution was similar across groups (54.9% normal vs 52.8% abnormal in normal BMI range). Socioeconomic status showed strong association, with pap smears. Gravidity revealed 79.2% multi-gravida women had abnormal smears vs 66.6% normal, though not significant. A higher proportion of abnormal Pap smears was seen in women with a positive family history, the association did not reach statistical significance Education distributions were similar among both groups (Table 1).

Poor hygiene strongly predicted abnormalities (50.9% abnormal vs 20.1% normal, p<0.0001). Menstrual issues were more common with abnormal smears - irregular cycles and heavy bleeding (p<0.0001). Clinical symptoms like vaginal discharge (58.5%), foul smell (43.4%) and postcoital bleeding (32.1%) strongly associated with abnormalities (p<0.0001) (Table 2).

Early marriage (<18 years) showed strongest association (60.4% abnormal vs 11.1% normal) (Table 3).

HPV-positive women had more abnormal smear (15.1% vs 3.5% normal, p=0.010). Regarding Pap smear test history, 85.4% of women with normal results and 88.7% of those with abnormal results were undergoing the test for the first time. Unhealthy cervix predicted abnormal smears (62.3% vs 43.1%) (Table 4).

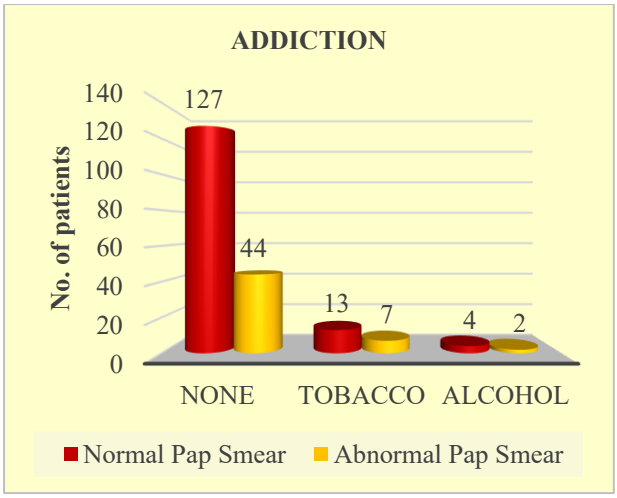

Figure 1: Distribution of addiction patterns among pregnant women with normal vs. abnormal Pap smears.

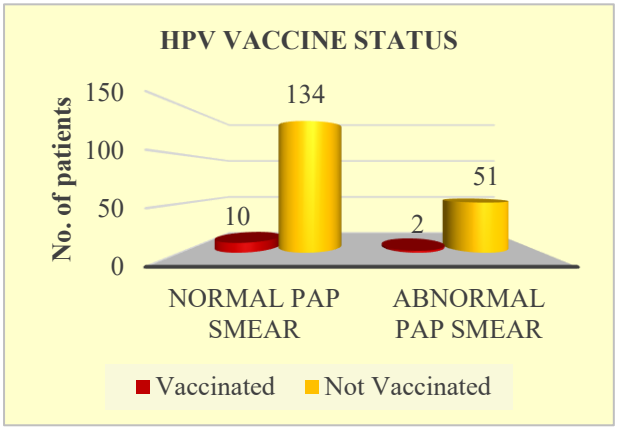

Figure 2: HPV vaccination status in pregnant women stratified by normal and abnormal pap smear results.

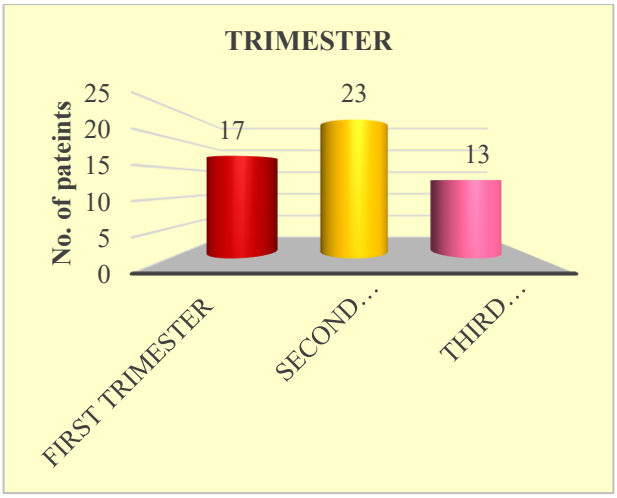

Figure 3: Frequency of abnormal Pap smears across pregnancy trimesters.

Addictions and vaccination showed no significant effects (p>0.05) (Figure 1 and 2). The analysis of 197 Pap smears revealed 73.1% normal findings (Group I), with abnormal results including 10.7% ASCUS (Group II), 8.6% Low SIL (Group III) and 7.6% High SIL (Group IV). No squamous cell carcinoma (Group V, 0.0%) was detected. (Table 5).

Second trimester had highest abnormal rate (43.4%) but that wasn't significant (p=0.593) (Figure 3). The analysis of 197 pregnant women revealed age-specific cytological patterns women aged 20-30 years showed the highest normal results (83.7%), while those aged 30-40 years had the most High SIL cases (17.9%). The <20 years group exhibited the highest ASCUS rate (23.8%) and no SCC cases (0.0%) were detected across all age groups. These findings validate a clear age-dependent distribution of cervical abnormalities (Table 6).

Table 1: Association between socio-demographic characteristics and pap smear results.

Socio-demographics		Normal pap smear (n=144)	Abnormal pap smear (n=53)	P value
Age group (in years)	<20	12 (8.3%)	9 (17.0%)	X=4.943 p=0.176
	20-30	87 (60.4%)	17 (32.1%)	
	30-40	41 (28.5%)	26 (49.0%)	
	>40	4 (2.8%)	1 (1.9%)	
Residence	Urban	65 (45.1%)	17 (32.1%)	X=2.210 p=0.137
	Rural	79 (54.9%)	36 (67.9%)	
BMI	Underweight	22 (15.3%)	5 (9.4%)	X=1.746 p=0.627
	Normal	79 (54.9%)	28 (52.8%)	
	Overweight	30 (20.8%)	14 (26.4%)	
	Obese	13 (9.0%)	6 (11.3%)	
Socioeconomic status	Upper middle	13 (9.0%)	2 (3.8%)	X=20.915 p=0.0001*
	Lower middle	66 (45.8%)	10 (18.9%)	
	Upper lower	35 (24.3%)	14 (26.4%)	
	Lower class	30 (20.8%)	27 (50.9%)	
GPAL status	Primi-gravida	48 (33.3%)	11 (20.8%)	X=2.353 p=0.125
	Multi-gravida	96 (66.6%)	42 (79.2%)	

Continued

Socio-demographics		Normal pap smear (n=144)	Abnormal pap smear (n=53)	P value
Occupation	Housewife	98 (68.1%)	38 (71.6%)	X=1.117 p=0.291
	Working	46 (31.9%)	26 (24.5%)	
Family history	Present	8 (5.5%)	7 (13.2%)	X=2.229 p=0.135
	Absent	136 (94.5%)	46 (86.8%)	
Education level	Graduate	24 (16.7%)	6 (11.3%)	X=1.449 p=0.694
	Senior secondary	74 (51.4%)	27 (50.9%)	
	Middle school	30 (20.8%)	13 (24.5%)	
	Illiterate	16 (11.1%)	7 (13.2%)	

*Statistically significant

Table 2: Association of clinical characteristics with pap smear results.

Clinical characteristics		Normal pap smear (n=144)	Abnormal pap smear (n=53)	P value
Personal hygiene	Good	115 (79.9%)	26 (49.1%)	X=4.25 p<0.0001*
	Poor	29 (20.1%)	27 (50.9%)	
Menstrual complaints	None	101 (70.1%)	13 (24.5%)	X=36.6 p<0.0001*
	Irregular cycles	24 (16.7%)	15 (28.3%)	
	Heavy bleeding	19 (13.2%)	25 (47.2%)	
Symptoms	No symptom	116 (80.5%)	7 (13.2%)	X=104.6 p<0.0001*
	Vaginal discharge	18 (12.5%)	31 (58.5%)	
	Foul-smelling discharge	9 (6.3%)	23 (43.4%)	
	Postcoital bleeding	4 (2.8%)	17 (32.1%)	
	Intermenstrual bleeding	6 (4.2%)	9 (17.0%)	

*Statistically significant

Table 3: Association between age at marriage and pap smear abnormalities.

Age of marriage (in years)	Normal pap smear (n=144)	Abnormal pap smear (n=53)	P value
<18	16 (11.1%)	32 (60.4%)	X=53 p<0.0001*
18-25	92 (63.9%)	11 (20.8%)	
25-35	29 (20.1%)	8 (15.1%)	
>35	7 (4.9%)	2 (3.8%)	

*Statistically significant

Table 4: Association of HPV status, screening history and cervical findings with pap smear results.

Predictors		Normal pap smear (n=144)	Abnormal pap smear (n=53)	P value
HPV infection	HPV positive	5 (3.5%)	8 (15.1%)	X=6.709 p=0.010*
	HPV negative	139 (96.5%)	45 (84.9%)	
Pap smear test history	First time	123 (85.4%)	47 (88.7%)	X=0.127 p=0.721
	Repeated	21 (14.6%)	6 (11.3%)	
Cervical health	Healthy cervix	82 (56.9%)	20 (37.7%)	X=4.981 p=0.026*
	Unhealthy cervix	62 (43.1%)	33 (62.3%)	

*Statistically significant

Table 5: Distribution of cervical cytology results by Bethesda classification in pregnant women, stratified by residence and BMI.

Cytological classification	Total (n=197)	%
Group I-normal/inflammatory	144	73.1
Group II-ASCUS	21	10.7
Group III-low SIL	17	8.6
Group IV-high SIL	15	7.6
Group V-squamous cell carcinoma	0	0.0

Table 6: Association of age with abnormal pap smear and bethesda classification.

Age group (in year)	Total (n=197)	Normal/ inflammatory (Group I)	ASCUS (Group II)	Low SIL (Group III)	High SIL (Group IV)	SCC (Group V)
<2	21	12 (57.1%)	5 (23.8%)	3 (14.3%)	1 (4.8%)	0 (0.0%)
20–30	104	87 (83.7%)	10 (9.6%)	5 (4.8%)	2 (1.9%)	0 (0.0%)
30–40	67	41 (61.2%)	5 (7.5%)	9 (13.4%)	12 (17.9%)	0 (0.0%)
>40	5	4 (80.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	197 (100%)	144 (73.1%)	21 (10.7%)	17(8.6%)	15(7.6%)	0 (0.0%)

DISCUSSION

Cervical cancer is a preventable yet underdiagnosed malignancy, particularly in low- and middle-income countries like India, where routine screening is limited and awareness is low. The Pap smear test, a simple and cost-effective method, offers an opportunity for early detection of precancerous lesions and infections. However, its uptake remains suboptimal, especially among young, reproductive-age women. Pregnancy provides a unique opportunity for screening, as women have more frequent interactions with the healthcare system. Despite this, routine Pap smear testing is often neglected during antenatal care.

Therefore, this study evaluates the prevalence and risk factors of abnormal Pap smear findings in pregnant women, highlighting the importance of integrating cervical screening into antenatal care. The findings aim to improve early detection, treatment and maternal outcomes while guiding public health strategies to reduce cervical cancer in vulnerable groups. The present study reported a 26.9% prevalence of abnormal Pap smear results among pregnant women, indicating that more than one-fourth of antenatal women screened harboured some form of cytological abnormality. This prevalence is comparable to global trends but varies across studies. For instance, Niyaf et al, reported a higher prevalence of 51.55%, while Ngaojaruwong et al and Khaengkhor et al, reported 38% and 40.6%, respectively.[11-13]

These elevated figures may be due to variations in population characteristics, prevalence of infections or more inclusive diagnostic thresholds. In contrast, studies like Mishra V et al. reported lower prevalence rates of 3% and 0.3%, respectively.[14] This stark difference could be attributed to smaller sample sizes, underreporting or lack of proper cytological techniques. Thus, the current study supports the notion that Pap smear testing during pregnancy serves as a vital diagnostic opportunity, aligning with recommendations by the American College of Obstetricians and Gynecologists (ACOG) that advocate cervical screening during the first prenatal visit if not previously done. In the present study, 73.1% of the women had normal/inflammatory smears, while 10.7% showed ASCUS, 8.6% LSIL and 7.6% HSIL. These findings are significant, indicating a considerable proportion of women at risk for premalignant changes. When compared with other studies, Sueblinvong et al, found 0.4% each for LSIL and HSIL.[15] Pokharel et al, observed a 0.5% LSIL rate and 66.5% negative for intraepithelial lesion or malignancy.[16] Niyaf et al, found 1% each for ASCUS and LSIL and 3% trichomonas, 7% candida and 9% bacterial vaginosis.[11] These comparisons reflect both the biological diversity of study populations and emphasize that even low-grade lesions identified early can lead to significant reductions in morbidity if appropriately monitored.

A highly significant association (p=0.0001) was observed between lower socioeconomic status and abnormal Pap smears in the current study. Over 50.9% of women with abnormal results belonged to the lower class, indicating that poverty may influence cervical health through multiple pathways including poor hygiene, low awareness, nutritional deficiencies and limited healthcare access. This finding is in agreement with Niyaf et al, who also showed significant correlation and Shrestha et al, who reported the impact of socioeconomic disparities on Pap smear outcomes.[11,17]

These results support the need for targeted educational interventions and accessible screening programs in underserved populations. In our study, 50.9% of women with abnormal smears had poor genital hygiene and this association was statistically significant (p<0.0001). Similar conclusions were drawn by Mohindroo et al and Himabindu et al, where poor hygiene was linked to chronic cervicitis and subsequent cytological abnormalities.[18,19] Although the education level did not show a statistically significant difference in our study (p=0.694), trends indicate that lower education levels correlate with higher smear abnormalities. In Niyaf et al, 83.33% of illiterate women had abnormal smears.[11]

This aligns with the understanding that health literacy affects health-seeking behavior and personal care. A statistically significant association was found between early age of marriage (<18 years) and abnormal cytology (p<0.0001), with 60.4% of women with abnormal smears falling in this category. This is consistent with Niyaf et al, where 86.56% of abnormal smears were in women with coitarche before 21 years and Sueblinvong et al and Mannikam also emphasized early sexual debut as a risk factor due to prolonged HPV exposure.[11,15,20] Given that early marriage and childbirth are still prevalent in many

regions, this reinforces the need for preconception and adolescent reproductive health education. Our study reported a statistically significant correlation between HPV positivity (15.1%) and abnormal cytology (p=0.010), reinforcing global evidence about the etiological role of HPV in cervical lesions. This supports the findings of Pokharel et al and other.[11,12,16] However, HPV vaccination status did not show a significant difference, which may be attributed to the low number of vaccinated women in the cohort (only 6.9% in the normal group and 3.8% in the abnormal group). This reflects low vaccine uptake and highlights the need for strengthening HPV immunization programs. Symptomatology such as vaginal discharge, foul smell, postcoital bleeding and intermenstrual bleeding showed a highly significant association (p<0.0001) with abnormal Pap smears in this study.

Only 13.2% of the abnormal group were asymptomatic, compared to 80.5% in the normal group. These findings indicate that symptomatic women should be prioritized for early screening. Similarly, an unhealthy cervix on speculum examination correlated significantly (p=0.026) with abnormal cytology. This observation supports findings from Mohindroo et al and Himabindu et al and it validates those visual cervical changes are a strong clinical indicator for cytological abnormalities.[18,19] While the association between gravidity and Pap smear abnormality was not statistically significant (p=0.125), 79.2% of women with abnormal smears were multigravida. This aligns with studies by Mannikam and others who reported similar patterns.[20-22]

This suggests that parity may indirectly contribute to cervical trauma or persistent HPV infection. With regard to the trimester of pregnancy, the highest proportion of abnormal smears occurred in the second trimester (43.4%), though this was not statistically significant (p=0.593). Studies like Pokharel et al, support the feasibility and importance of screening at any gestational age, especially during the first prenatal visit, as recommended by ACOG.[16] In the present study, occupation (housewife vs. working), addiction (tobacco, alcohol) and Pap smear history did not show significant associations with abnormal cytology.

Tobacco and alcohol use were low (13.2% and 3.8% in the abnormal group), aligning with Niyaf et al, (0.52%) and Mohindroo et al, (0.9%).[11,18] However, Ngaojaruwong et al, reported a stronger association with smoking (6.8%), suggesting cultural and regional variation.[12] Our study did not evaluate contraception directly, but Niyaf et al, found higher abnormalities in IUCD users, echoing findings by Mohindroo et al, Further investigation through longitudinal cohort studies could clarify these associations.[11,18]

CONCLUSION

This study advocates for the integration of cervical cancer screening into antenatal care protocols, particularly in low-resource settings where women may not have access to routine gynecological evaluations otherwise. Enhancing awareness, promoting HPV vaccination, delaying early marriages and ensuring adequate hygiene education should be prioritized to reduce the future burden of cervical cancer. The findings of this study serve as a compelling reminder of the need for a proactive approach toward women's health, starting from pregnancy itself.

However, the study has some limitations. It was conducted at a single centre with a limited sample size, which may not represent the broader population. Additionally, being cross-sectional in nature, it cannot establish causal relationships between risk factors and abnormal Pap smear findings. To address these limitations, several recommendations are made. Pap smear screening should be incorporated into routine antenatal care, especially at the first visit. Larger, multicentric studies with follow-up are needed to validate the findings and assess outcomes. Awareness campaigns should be conducted to educate women about the importance of cervical cancer screening. Furthermore, HPV vaccination and regular cervical health check-ups should be promoted, particularly in rural and underserved populations.

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