

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20263416>

Original Research Article

Pap smear screening in mid-trimester pregnant women: a prospective observational study in a tertiary care centre

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Received: 28 May 2026

Revised: 25 August 2026

Accepted: 01 September 2026

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ABSTRACT

Background: Cervical cancer is preventable if detected early, yet it remains a leading cause of mortality among women in India. While routine cervical screening is often underutilized during gestation due to safety and precision concerns, there is growing clinical interest in evaluating its relevance during the mid-trimester of pregnancy (14–28 weeks) to optimize maternal health monitoring. The study aims to evaluate the baseline prevalence and associated risk factors of abnormal Pap smears in pregnant individuals, while monitoring the subsequent progression or regression of identified cellular dysplasia throughout the postnatal period.

Methods: This hospital-based, single-site, prospective cross-sectional observational study systematically sampled and enrolled antenatal patients attending the outpatient department of Obstetrics and Gynecology at Silchar Medical College and Hospital during their mid-trimester (14–28 weeks).

Results: Cytological results from 200 participants revealed 47.4% normal smears, 28.65% inflammatory smears, 14.58% candidiasis, 4.69% bacterial infections and 3.65% *Trichomonas vaginalis*. Smear findings varied significantly across gestational age groups ($p=0.001\%$), with normal cytologies peaking at 19–23 weeks (57.6%) and candidiasis staging higher at 14–18 weeks.

Conclusions: Mid-trimester Pap smears are a safe, practical tool for opportunistic prenatal screening. Younger age groups (21–25 years) correlate with normal findings, whereas older cohorts trend toward inflammatory updates.

Keywords: Antenatal care, Cervical cancer, Cervical screening, Candidiasis, Pap smear, Pregnancy, Vaginal infection

INTRODUCTION

Cervical cancer is the fourth most common malignancy among women worldwide, contributing significantly to morbidity and mortality.¹ Persistent infection with high-risk human papillomavirus (HPV) is the primary etiological factor and untreated precancerous lesions may progress to invasive cancer.²

Pregnancy presents challenges for cervical cancer screening due to physiological changes in the cervix and concerns regarding safety.³ However, the mid-trimester (14–28 weeks) is considered a relatively safe period for Pap smear screening, as cervical accessibility is improved and the risk of complications is lower.⁴ The Papanicolaou

(Pap) smear, a cytological test that collects cells from the cervix to identify abnormal alterations, has been the recognized screening method for cervical cancer since its creation in the 1940s. The procedure is a fantastic option for routine screening because it is simple, inexpensive and non-invasive. The safety of Pap smears during pregnancy has been disputed, nevertheless, with some people theorizing that they may increase the risk of pregnancy complications like miscarriage or pre-term birth. Fortunately, studies have shown that, when performed correctly, the Pap smear is generally safe during pregnancy and does not significantly increase the risk of adverse outcomes.⁵ Screening during this period may facilitate early detection of cervical abnormalities, although interpretation can be difficult due to pregnancy-related

cytological changes.⁵ This study aims to evaluate Pap smear screening in mid-trimester pregnant women attending a tertiary care centre.

Aim and objectives

To assess the prevalence of abnormal Pap smear in pregnant women and its associated risk factors. To study the progression or regression of cellular dysplasia by following the patients with the same in their postnatal period.

METHODS

This is a hospital-based, single-center, prospective cross-sectional observational study was conducted in the Department of Obstetrics and Gynecology, Silchar Medical college and Hospital (SMCH), from 1 November 2023 to 31 October 2024.

Inclusion criteria

Pregnant women between 14-28 weeks of gestation attending antenatal OPD who gives consent for testing.

Exclusion criteria

History of threatened abortion in present pregnancy. Unwillingness to undergo Pap smear. History of vaginal intercourse, vaginal examination or vaginal medication within the past 48 hours or bleeding per vagina. Preterm labor, premature rupture of membranes or obvious cervical dilatation. Patients presenting with antepartum hemorrhage, ruptured ectopic pregnancy or other bleeding Conditions

Sample size

The sample size was calculated using Daniel's formula: $N=n=4pq/d^2$,

with $p=8\%$, $q=92\%$, $2=1.96$ at 95% confidence interval, giving a sample size of 200.

Eligible participants were selected using systematic sampling (every fourth patient). After obtaining informed written consent, demographic and clinical data were collected using a structured questionnaire. Pap smear samples were collected in lithotomy position using Ayre's spatula for ectocervical cells and cytobrush for endocervical cells.

Smears were fixed in 95% alcohol, stained using Papanicolaou stain and reported according to the Bethesda System 2014. Participants were categorized as NILM, ASC-US, LSIL, HSIL, AGC or malignancy.

Women with abnormal results were followed up at 6 weeks postpartum and managed as per ASCCP guidelines.

Ethical considerations

Ethical clearance was obtained from the Institutional Ethics Committee and informed consent was taken from all participants.

Statistical analysis

Statistical analysis was performed using SPSS software. Descriptive statistics were used and Chi-square test was applied with significance set at $p<0.05$.

RESULTS

A total of 200 antenatal women in the mid-trimester (14-28 weeks) were included in the study. The socio-demographic and obstetric characteristics are summarized in Table 1.

The majority of participants belonged to the age group of 21–25 years (45%), followed by 26–30 years (25.5%). Most women were primiparous (63%), while 37% were multiparous. Nearly half of the participants were between 19–23 weeks of gestation (49%), followed by 14–18 weeks (38.5%). According to socioeconomic status, the largest proportion of participants belonged to the upper lower class (40.5%), followed by lower class (25%). Most participants had completed senior secondary education (65.5%), while 20% were graduates.

Hypertension (26.5%) was the most common comorbidity, followed by anaemia (17.5%), thyroid disorders (11%) and diabetes (7%). The majority of women were married between 21–25 years (57.5%) and resided in rural areas (61.5%). Most participants (97.5%) had no history of smoking or alcohol consumption.

Pap smear adequacy showed that 192 (96%) smears were adequate, while 8 (4%) were inadequate. The distribution of Pap smear findings is shown in Table 2. Out of the 192 adequate smears, the majority were normal (47.40%), followed by inflammatory smears (28.65%). Candidiasis was observed in 14.58% of cases, while bacterial infection and *Trichomonas vaginalis* were seen in 4.69% and 3.65% respectively.

Epithelial cell abnormalities were rare, with only one case each of low-grade squamous intraepithelial lesion (LSIL) and atypical squamous cells of undetermined significance (ASC-US), accounting for 0.52% each.

The overall prevalence of abnormal Pap smear (LSIL+ASC-US) in this study was 1.04%.

A statistically significant association was observed between Pap smear findings and age ($p=0.048$) as well as gestational age ($p=0.001$). However, no significant association was found with parity ($p=0.847$).

Table 1: Socio-demographic and obstetric characteristics of study participants (n=200).

Variable	Category	Frequency (N)	(%)
Age group (in years)	21–25	90	45.0
	26–30	51	25.5
	31–35	36	18.0
	>35	23	11.5
Parity	Primipara	126	63.0
	Multipara	74	37.0
Gestational age (in weeks)	14–18	77	38.5
	19–23	98	49.0
	24–28	25	12.5
Socioeconomic status	Lower	50	25.0
	Upper lower	81	40.5
	Lower middle	36	18.0
	Upper middle	22	11.0
	Upper	11	5.5
Education status	Graduate	40	20.0
	Senior secondary	131	65.5
	Middle school	17	8.5
	Illiterate	12	6.0
Comorbidities	Anaemia	35	17.5
	Hypertension	53	26.5
	Diabetes	14	7.0
	Thyroid disorder	22	11.0
	None	80	40.0
Age at marriage (in years)	21–25	115	57.5
	26–30	57	28.5
	31–35	17	8.5
	>35	11	5.5
Residence	Rural	123	61.5
	Urban	77	38.5
Personal history	Smoking	2	1.0
	Alcohol	3	1.5
	None	195	

Table 2: Distribution of Pap smear findings among study participants (n=192).

Pap smear findings	Frequency (N)	(%)
Normal smear	91	47.40
Inflammatory smear	55	28.65
Bacterial infection	9	4.69
Candidiasis	28	14.58
Trichomonas vaginalis	7	3.65
LSIL	1	0.52
ASC-US	1	0.52

Table 3: Association of Pap smear findings with selected variables.

Variable	Category	Normal (%)	Inflammatory (%)	Others (%)	P value
Age group (in years)	21–25	89.80	65.31	Low	0.048
	26–30	48.98	8.16	Low	
	31–35	24.49	22.45	Low	
	>35	22.45	16.33	Low	
Parity	Primipara	47.97	27.64	Low	0.847
	Multipara	46.38	30.43	Low	

Continued.

Variable	Category	Normal (%)	Inflammatory (%)	Others (%)	P value
Gestational age (in weeks)	14–18	33.33	25.37	Higher candidiasis	0.001
	19–23	57.58	30.30	Low	
	24–28	44.44	29.63	Low	

DISCUSSION

Cervical cancer remains a major public health concern, particularly in developing countries like India, where organized screening programs are limited.¹ Pregnancy offers a unique opportunity for opportunistic screening, as many women access healthcare services during this period.³ The present study evaluated the role of Pap smear screening in mid-trimester pregnant women and its associated factors. In this study, the prevalence of abnormal Pap smears (LSIL and ASC-US) was 1.04%. This finding is comparable to studies conducted by Siddiqui et al (0.7%) and Mukhtar et al (0.8%).^{6,7} The low prevalence of epithelial abnormalities during pregnancy may be attributed to the relatively younger age group of participants and the transient nature of HPV infections.³ These findings reinforce that while abnormal cytology is uncommon, screening remains essential for early detection.

Pap smear adequacy

In this study, 96% of smears were adequate, which is comparable to findings by Agarwal et al (98.3%) and Na et al (97%).^{8,9} This high adequacy rate indicates that Pap smears can be safely and effectively performed during the mid-trimester, supporting their feasibility as a screening tool during pregnancy.

Demographic characteristics

The majority of participants in this study belonged to the 21–25 years age group (45%), which is consistent with studies by Gill et al and Agrawal et al.^{10,11} Most women were primiparous (63%), contrasting with some studies where multiparity was more common. This difference may reflect regional demographic variations. A large proportion of participants belonged to rural areas (61.5%) and lower socioeconomic groups, highlighting disparities in healthcare access and the importance of antenatal visits as an opportunity for screening.³

Pattern of pap smear findings

The majority of smears were normal (47.40%), followed by inflammatory smears (28.65%) and infections such as candidiasis (14.58%). Similar findings have been reported in previous studies, where inflammatory changes constituted a significant proportion of cytological findings.⁵ The high prevalence of inflammatory and infectious conditions may be attributed to poor genital

hygiene, low socioeconomic status and limited awareness regarding reproductive health.

Association with age

A statistically significant association was observed between age and Pap smear findings ($p=0.048$). Younger women showed a higher proportion of normal smears, while abnormal and inflammatory findings tended to increase with age. This is consistent with the natural history of HPV infection, where persistent infections and the risk of dysplasia increase with advancing age.⁷

Association with parity

No significant association was found between parity and Pap smear findings ($p=0.847$). This suggests that parity alone may not independently influence cervical cytological abnormalities, which aligns with findings from several previous studies.¹⁰

Association with gestational age

A significant association was observed between gestational age and Pap smear findings ($p=0.001$). Normal smears were most common in the 19–23 weeks group, while candidiasis was more prevalent in earlier gestational ages. This may be explained by hormonal and immunological changes during pregnancy, which influence vaginal flora and cervical cytology.³

Postnatal follow-up

Follow-up of abnormal cases revealed regression in one case of LSIL, while the ASC-US case remained unchanged. This supports previous evidence that many low-grade lesions regress spontaneously postpartum, emphasizing the importance of conservative management during pregnancy.⁶

Clinical implications

The findings of this study highlight that Pap smear screening during pregnancy is safe and feasible, effective in detecting infections and early lesions. A valuable opportunity for screening in low-resource settings. Given the low prevalence of abnormal cytology but high prevalence of infections, integrating cervical screening into routine antenatal care can significantly improve women's reproductive health outcomes.

This study's strengths include its prospective design, adequate sample size (n=200) and inclusion of postnatal follow-up. However, being a single-center study with limited follow-up duration and lack of HPV testing correlation may affect the generalizability and depth of findings.

Limitations

This study has a few limitations. First, as a single-centre investigation conducted within a tertiary care institution, the study population reflects localized demographic characteristics, which may limit the generalizability of the findings to broader geographic or community-based settings. Second, screening relied solely on conventional Pap smear cytology without concurrent high-risk HPV DNA testing, potentially underestimating the true prevalence of underlying viral infections. Finally, the relatively brief postnatal follow-up period restricts the capacity to evaluate long-term lesion persistence, clearance or recurrence patterns over an extended timeline.

CONCLUSION

Pap smear screening in mid-trimester pregnant women is a safe, effective and practical strategy for early detection of cervical abnormalities. The study also found a high percentage of adequate Pap smears (96%), indicating the quality of the screening process. In the postnatal period, abnormal smears such as LSIL showed regression to normal after six weeks, emphasizing the importance of follow-up care. Overall, the study provides valuable insights that can inform healthcare strategies for early detection and prevention of cervical cancer, especially among younger women and those from specific socio-economic backgrounds. Although the prevalence of abnormal cytology is low, routine antenatal screening provides a crucial opportunity for early diagnosis, especially in resource-limited settings.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Banerjee A, Dey A, Patil PV. Pap smear screening in mid-trimester pregnant women: a prospective observational study in a tertiary care centre. Int J Reprod Contracept Obstet Gynecol 2026;15:3852–6.