International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Nisiya KS et al. Int J Reprod Contracept Obstet Gynecol. 2026 Sep;15(9):3615-3620
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20263049

Original Research Article

Prevalence of abnormal Papanicolaou smear among women attending a tertiary care hospital in South Kerala

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Received: 27 July 2026
Revised: 11 August 2026
Accepted: 12 August 2026

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ABSTRACT

Background: Cervical cancer remains an important preventable cause of morbidity and mortality among women, particularly where access to vaccination, screening and timely treatment is limited. Persistent infection with high-risk human papillomavirus (HPV) is the necessary cause of virtually all cervical cancers. Although HPV-based testing is now preferred by the World Health Organization (WHO) for primary screening, conventional Papanicolaou (Pap) cytology continues to be used in many clinical settings, including opportunistic screening. This study assessed the prevalence and pattern of abnormal Pap smear findings among women attending a tertiary care hospital in South Kerala and explored selected socio-demographic, reproductive and clinical characteristics.

Methods: This hospital-based cross-sectional study included 175 sexually active women aged ≥18 years attending the Department of Obstetrics and Gynaecology, SUT Academy of Medical Sciences, Vattapara, Thiruvananthapuram, from March to June 2021. Socio-demographic, reproductive and clinical information was collected using a pre-tested semi-structured questionnaire. Conventional Pap smears were obtained using an Ayre's spatula, fixed immediately and reported according to the Bethesda System 2001. Data were analysed using SPSS version 25.0. Categorical associations were assessed using the Chi-square or Fisher's exact test, as appropriate.

Results: Of 175 participants, 140 (80.0%) were aged ≥35 years. Four women (2.3%; 95% CI approximately 0.9-5.7%) had abnormal cytology, while 171 (97.7%) had negative for intraepithelial lesion or malignancy (NILM) reports. The abnormalities were LSIL in 2 (1.1%), ASC-US in 1 (0.6%) and squamous cell carcinoma in 1 (0.6%). Vaginal discharge was the commonest presenting complaint (32.0%), while bulky cervix (31.4%) and cervical erosion (26.3%) were the commonest per-speculum findings. All four abnormal smears occurred among women aged ≥35 years; however, the association between age group and abnormal cytology was not statistically significant (Fisher's exact test, p=0.585).

Conclusions: Although the prevalence of abnormal Pap cytology was low in this hospital-based cohort, clinically important lesions, including LSIL and invasive squamous cell carcinoma, were detected. The findings support continued opportunistic screening and strengthen the case for systematic, high-quality cervical screening programmes. Pap cytology remains useful where it is available, while HPV-based primary screening should increasingly be incorporated in accordance with contemporary national and international guidance.

Keywords: Cervical cancer, Papanicolaou smear, Cervical cytology, Bethesda system, Cervical screening, LSIL, HPV

INTRODUCTION

Cervical cancer is a major public health problem despite being one of the most preventable cancers. Current WHO estimates indicate that approximately 604,000 women were diagnosed with cervical cancer and about 280,000 died from the disease in 2024.[1] The burden remains disproportionately high in low- and middle-income countries, reflecting inequities in HPV vaccination, screening and access to treatment. Persistent infection with

oncogenic HPV types is responsible for virtually all cervical cancers.[1,5]

The natural history of cervical cancer provides a substantial opportunity for prevention because persistent HPV infection may progress through recognizable precancerous lesions before invasive disease develops. Primary prevention through HPV vaccination and secondary prevention through screening and treatment of precancerous lesions form the central pillars of cervical cancer elimination. WHO's global strategy aims for 90% HPV vaccination coverage among girls, 70% screening coverage and appropriate treatment of 90% of women with precancer or invasive cancer by 2030.[2]

Screening strategies have evolved from conventional cytology and visual inspection methods towards HPV-based testing. WHO currently recommends HPV DNA testing as the preferred primary screening approach because it is more sensitive for clinically important precancerous disease and is less dependent on subjective cytological interpretation.[3,4] Nevertheless, conventional Pap cytology continues to have practical relevance in many hospitals and screening services, particularly where HPV testing is not yet routinely accessible.

The epidemiology of cervical screening in India also highlights a persistent implementation gap.[6,7] National survey analyses have reported very low uptake of cervical cancer screening, with important inequalities related to education, socioeconomic position and access to health services. Studies from Kerala similarly demonstrate that awareness does not always translate into screening uptake.[7] These gaps make opportunistic screening in gynaecology services an important complementary strategy while organized population-based programmes are strengthened.

Against this background, the present study was undertaken to determine the prevalence and cytological pattern of abnormal Pap smear findings among women attending a tertiary care hospital in South Kerala and to describe their association with selected socio-demographic, reproductive and clinical characteristics.

METHODS

Study design and setting

This hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, SUT Academy of Medical Sciences, Vattapara, Thiruvananthapuram, Kerala, from March to June 2021.

Study population

Sexually active women aged ≥18 years attending the outpatient department during the study period were eligible for participation.

Inclusion criteria

Sexually active women aged ≥18 years attending the Department of Obstetrics and Gynaecology outpatient clinic during the study period who provided written informed consent were included.

Exclusion criteria

Women unwilling to undergo Pap smear examination, with active per-vaginal bleeding, menstruating, who had undergone hysterectomy; and women who had received recent local treatment for vaginitis were excluded.

Sample size

The sample size was calculated using $N=(Z\alpha)^2\times p\times q/d^2$, where Zα was 1.96 for a 95% confidence level, the expected prevalence (p) of abnormal Pap smear was taken as 41.62% based on the study cited in the original protocol, q=58.38%, and the allowable error (d) was 20% of the expected prevalence. The calculated minimum sample size was 145. After allowing for a 20% non-response rate, the final sample size was 175 participants.

Data collection

A pre-tested, interviewer-administered semi-structured questionnaire was used to collect socio-demographic information, obstetric and reproductive history, menstrual and sexual history, contraceptive use, presenting complaints and selected behavioural and clinical risk factors. Socioeconomic status was assessed using the Modified Kuppuswamy Scale.

A detailed clinical examination, including per-speculum examination, was performed with the woman in the dorsal lithotomy position. A sterile Cusco's speculum was introduced without lubricant. After visualization of the cervix, exfoliated cells were collected from the transformation zone using an Ayre's spatula by rotating it through 360°. The material was evenly spread on a clean glass slide and immediately fixed in 95% ethyl alcohol. Conventional Pap staining was performed, and smears were examined by a pathologist. Cytological findings were reported using the Bethesda System 2001 terminology.

Outcome measures

The primary outcome was the prevalence of abnormal Pap smear findings. Secondary outcomes were the distribution of abnormalities according to Bethesda 2001 categories and pattern of selected socio-demographic, reproductive, behavioural and clinical characteristics among study participants.

Statistical analysis

Data were entered into Microsoft excel and analysed using SPSS version 25.0. Continuous variables were expressed

as mean ± standard deviation and categorical variables as frequencies and percentages. The prevalence of abnormal cytology was expressed as a proportion with an approximate 95% confidence interval.

Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. A $p<0.05$ considered statistically significant.

Ethical considerations

The study was approved by the Institutional Ethics Committee of SUT Academy of Medical Sciences, Vattapara, Thiruvananthapuram, before commencement. Written informed consent was obtained from all participants, and confidentiality of study information was maintained throughout.

RESULTS

A total of 175 women were included in the study. The socio-demographic, reproductive, clinical and screening characteristics are summarized below.

Most participants were aged ≥35 years (80.0%). Secondary education was the most frequent educational category (44.6%), 73.7% were homemakers, and 43.4% belonged to the lower-middle socioeconomic category. Most participants were married (78.9%).

Multiparous women constituted 77.7% of the study population. Early marriage (<20 years) was reported by 62.9%, and 57.7% reported first childbirth before 20 years. Previous oral contraceptive use, condom use and IUCD use were reported by 9.7%, 25.7% and the 4.0%, respectively.

Vaginal discharge was the commonest presenting complaint (32.0%), followed by persistent backache (18.3%) and abnormal uterine bleeding (14.9%).

Awareness regarding cervical cancer screening was reported by 62.9% of participants, but only 12.6% had undergone a previous Pap smear. Smoking, previous sexually transmitted infection and multiple sexual partners/second or third marriage were reported by 6.3%, 8.6% and 13.7%, respectively.

The most frequent per-speculum findings were a bulky cervix (31.4%) and cervical erosion (26.3%). A fungating growth was documented in one participant and genital warts in one participant.

Four women (2.3%) had abnormal cytology. LSIL was the most frequent abnormality (1.1%), followed by ASC-US (0.6%) and squamous cell carcinoma (0.6%). No ASC-H, HSIL, AGC or adenocarcinoma was identified.

All four abnormal Pap smear results occurred among women aged ≥35 years. No abnormal cytology was detected in women younger than 35 years; however, the difference was not statistically significant (Fisher's exact test, $p=0.585$). The small number of abnormal outcomes substantially limits statistical power.

Table 1: Socio-demographic characteristics of the study participants, (n=175).

Variables	Category	N	Percentages (%)
Age (in years)	<35	35	20.0
	≥35	140	80.0
Education	Illiterate	0	0.0
	Primary	2	1.1
	Secondary	78	44.6
	Higher Secondary	52	29.7
	Graduate and above	43	24.6
Occupation	Homemaker	129	73.7
	Employed	46	26.3
Socioeconomic status	Upper	2	1.1
	Upper middle	58	33.1
	Lower middle	76	43.4
	Upper lower	38	21.7
	Lower	1	0.6
Marital status	Married	138	78.9
	Widow/separated	37	21.1

Table 2: Obstetric and reproductive characteristics of the study participants, (n=175).

Variables	Category	N	Percentages (%)
Parity	Nulliparous	16	9.1
	Primiparous	23	13.1
	Multiparous	136	77.7

Continued.

Variables	Category	N	Percentages (%)
Age at marriage (in years)	<20	110	62.9
	≥20	65	37.1
Age at first childbirth (in years)	<20	101	57.7
	≥20	74	42.3
Oral contraceptive use	Yes	17	9.7
	No	158	90.3
Condom use	Yes	45	25.7
	No	130	74.3
IUCD use	Yes	7	4.0
	No	168	96.0
Permanent sterilization	Yes	100	57.1
	No	75	42.9

Table 3: Clinical profile of study participants, (n=175).

Presenting complaint	N	Percentages (%)
Vaginal discharge	56	32.0
Pruritus	17	9.7
Abnormal uterine bleeding	26	14.9
Postcoital bleeding	5	2.9
Postmenopausal bleeding	22	12.6
Dyspareunia	17	9.7
Persistent backache	32	18.3

Table 4: Selected risk factors and screening-related characteristics, (n=175).

Risk factors	Yes, N (%)	No, N (%)
Smoking	11 (6.3)	164 (93.7)
Multiple sexual partners or second or third marriage	24 (13.7)	151 (86.3)
Previous sexually transmitted infection	15 (8.6)	160 (91.4)
Previous Pap smear	22 (12.6)	153 (87.4)
Awareness regarding cervical cancer screening	110 (62.9)	65 (37.1)
Poor menstrual hygiene (cloth reuse)	34 (19.4)	141 (80.6)

Table 5: Per-speculum examination findings, (n=175).

Per-speculum finding	N	Percentages (%)
Normal cervix	22	12.6
Cervical erosion	46	26.3
Bulky cervix	55	31.4
Cervix bleeds on touch	4	2.3
Cervical polyp	7	4.0
Cervical ulcer	0	0.0
Abnormal vascularity	0	0.0
Fungating growth	1	0.6
Genital warts	1	0.6

Table 6: Cytological findings according to Bethesda 2001 terminology, (n=175).

Pap smear result	N	Percentages (%)
NILM	171	97.7
ASC-US	1	0.6
LSIL	2	1.1
Squamous cell carcinoma	1	0.6
Total	175	100.0

Table 7: Association between age group and abnormal Pap smear, (n=175).

Age group (in years)	Normal Pap smear, N (%)	Abnormal Pap smear, N (%)	Total	P value
<35	35 (100.0)	0 (0.0)	35	0.585
≥35	136 (97.1)	4 (2.9)	140	
Total	171 (97.7)	4 (2.3)	175	

DISCUSSION

The present hospital-based study found abnormal cervical cytology in 4 of 175 women, giving a prevalence of 2.3%. Although this estimate is low, the study identified both premalignant lesions and an invasive squamous cell carcinoma, demonstrating the clinical value of cytological screening even when the overall yield of abnormalities is modest. The prevalence is within the range reported in several hospital-based cytology series, although direct comparisons are limited by differences in age structure, symptoms, eligibility criteria, screening history and cytological reporting practices.[10,11]

The predominance of women aged ≥35 years is relevant to the interpretation of the findings. All four abnormal smears occurred in this age group, although the association did not reach statistical significance (p=0.585). The absence of significance should not be interpreted as evidence that age is unrelated to cervical neoplasia; rather, only four abnormal outcomes were available for analysis. With such a small number of events, conventional association testing has limited power and confidence intervals would necessarily be wide. The age pattern nevertheless supports maintaining screening coverage in women in the age groups targeted by contemporary screening programmes.

The present findings should also be interpreted in the context of the changing cervical cancer screening landscape. WHO now recommends HPV-based testing as the preferred primary screening method and has emphasized high-performance screening as a key component of cervical cancer elimination.[3,4] Conventional Pap cytology remains an important service where it is already established, but programmes should progressively strengthen HPV-based screening, appropriate triage, linkage to diagnostic evaluation and treatment.

The low previous screening uptake in this cohort is noteworthy. Although 62.9% of participants reported awareness regarding cervical cancer screening, only 12.6% had a previous Pap smear. This gap between awareness and actual screening is consistent with evidence from Kerala and India showing that knowledge alone does not guarantee screening uptake. In a community study from Kerala, only 6.9% of women had ever undergone cervical screening, and knowledge-related barriers were an important reason for non-screening. National survey analyses have likewise demonstrated low screening coverage and socioeconomic inequalities in access.[6] These observations highlight the potential role of opportunistic screening during routine gynaecology visits.

Multiparity was common in the present cohort, with 77.7% of women being multiparous. Previous epidemiological research has described high parity as a cofactor associated with cervical cancer risk.[8,9] However, the present study was not powered to establish such an association because only four abnormal smears were observed. It would therefore be inappropriate to infer a causal relationship from the distribution of parity in this sample.

Vaginal discharge was the commonest presenting complaint, reported by 32.0% of participants. The study also documented cervical erosion in 26.3% and a bulky cervix in 31.4%. These clinical findings are common in gynaecological practice and are not, by themselves, diagnostic of cervical neoplasia. Their presence should therefore prompt appropriate clinical assessment rather than be interpreted as a surrogate marker of abnormal cytology.

The cytological distribution showed NILM in 97.7% of women, LSIL in 1.1%, ASC-US in 0.6% and squamous cell carcinoma in 0.6%. The identification of an invasive carcinoma in an apparently low-prevalence cohort is clinically important because screening programmes aim not only to estimate prevalence but also to identify individual women who require diagnostic evaluation and treatment. The study therefore illustrates the value of maintaining screening opportunities even in women without classic cervical cancer symptoms.

The study has several strengths. It was conducted in a tertiary-care gynaecology service, used a standardized cervical sampling procedure, and reported cytology using Bethesda terminology. It also captured a range of reproductive, behavioural and clinical characteristics that are relevant to cervical cancer prevention. Importantly, the manuscript distinguishes between awareness of screening and actual previous screening, highlighting a potentially actionable implementation gap.

Several limitations should be considered. First, the hospital-based cross-sectional design limits generalizability to the wider population. Second, the number of abnormal cytology outcomes was very small, limiting statistical power and precluding reliable multivariable analysis. Third, HPV testing was not performed, so the study cannot describe HPV prevalence or genotype-specific risk. Fourth, histopathological

confirmation was not available for all cytological abnormalities, and therefore cytology findings should not be equated with histologically confirmed CIN. Finally, the study was conducted in 2021; the findings therefore describe the screening context of that period and should be interpreted alongside current HPV-based screening recommendations.

Taken together, the findings support a pragmatic approach in which opportunistic screening remains valuable in gynaecology services while health systems move towards organized, HPV-based primary screening. Improving awareness should be accompanied by accessible testing, counselling, reliable referral pathways and timely treatment so that screening translates into reductions in cervical cancer incidence and mortality.

CONCLUSION

In this tertiary-care hospital cohort from South Kerala, abnormal Pap smear cytology was identified in 2.3% of women. Although the prevalence was low, clinically significant abnormalities including LSIL and squamous cell carcinoma were detected. All abnormal smears occurred among women aged ≥35 years, but the observed age association was not statistically significant because of the small number of abnormal outcomes.

The study emphasizes that opportunistic cervical screening can identify clinically important lesions among women attending routine gynaecology services. Contemporary cervical cancer prevention should increasingly incorporate HPV-based primary screening, while maintaining accessible cytology services where HPV testing is not yet routinely available. Improving screening uptake requires more than awareness alone; it requires affordable services, effective counselling, appropriate follow-up and timely treatment. Larger community-based studies incorporating HPV testing and histopathological correlation are warranted to define the current burden and risk profile of cervical epithelial abnormalities in South Kerala.

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: Nisiya KS, Nair L. Prevalence of abnormal Papanicolaou smear among women attending a tertiary care hospital in South Kerala. Int J Reprod Contracept Obstet Gynecol 2026;15:3615-20.