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Prevalence of Abnormal Cervical Cytology in Pregnant Women and Its Associated Risk Factors

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ABSTRACT

Background

Cervical and breast cancer are the leading malignancies among females in Nepal. The World Health Organization (WHO) reported a crude cervical cancer incidence rate in Nepal of 14.2 per 100,000 women per year in 2022. Antenatal cervical screening provides an excellent opportunity to screen and create awareness for further surveillance. This study aimed to determine the prevalence of abnormal cervical cytology among pregnant Nepalese women and identify associated risk factors.

Methods

An observational cross-sectional study was conducted in Department of Obstetrics and Gynaecology at a tertiary center. Pregnant women between 20 and 28 weeks of gestation attending antenatal check-ups underwent liquid-based cytology (LBC). Cytology results were reported using the Bethesda classification system (2014).

Results

Among 78 enrolled pregnant women who completed the study, cytology indicated abnormalities in 58 women (74.4%), while 20(25.6%) were negative for intraepithelial lesion or malignancy (NILM). Among abnormal findings, inflammatory changes were most frequent 29(37.2%), followed by bacterial vaginosis 12(15.4%), Trichomonas vaginalis 12(15.4%), and candidiasis 5(6.4%). No premalignant or malignant lesions were detected.

Conclusions

Antenatal cervical screening offers a valuable opportunity to detect genital infections, screen for cervical cancer precursors, and raise awareness for future screening. Liquid based cytology test is easy to perform, cost effective and does not adversely affect pregnancy, playing a crucial role in reducing preventable cervical disease burden in low-resource settings.

Keywords: antenatal screening; carcinoma cervix; genital infection; liquid based cytology; pregnancy.

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INTRODUCTION

Cervical cancer remain the most prevalent cancer and leading cause of cancer-related mortality among women in developing countries.[1] In Nepal, it represents the most common female malignancy with 2,169 new cases and 1,313 deaths translating to an incidence rate of 14.2 per 100,000 women (2022).[2] Although cervical cancer diagnosed during pregnancy is rare (estimated at 3.3-26 cases per 100,000 births[3]). Established risk factors for cervical dysplasia and cancer include early sexual contact, multiple sexual partners, high parity, concurrent microbial infection (e.g. HPV), immunosuppression, smoking, and prolonged oral contraceptive pill (OCP) use.[4,5] Western nations routinely incorporate cytology into antenatal protocols, screening uptake in LMIC like Nepal remains. Antenatal screening enables early detection of pre-invasive lesions, genital infections, and malignancies, facilitating timely intervention.[6] Consequently, pregnancy often represents the sole opportunity for cervical screening in these settings. This study aimed to determine the prevalence of abnormal cervical cytology among pregnant Nepalese women and identify associated risk factors.

METHODS

A cross-sectional study was conducted at Paropakar Maternity and Women's Hospital (PMWH), Kathmandu, Nepal, over three months. Ethical Approval was obtained from the Institutional Review Board (IRB) of the National Academy of Medical Sciences (NAMS) and the Institutional Review Committee (IRC) of PMWH (Reference number: 8/2081/82). Participants: Pregnant women aged 30–39 years at 20–28 weeks gestation attending the antenatal clinic.

Inclusion Criteria:

1. Age 30-39 years.
2. Gestation 20-28 weeks.

Exclusion Criteria:

1. Threatened abortion.
2. Placenta previa.
3. History of medical disorders (hypertension, diabetes mellitus with vasculopathy, renal disease, anti-phospholipid antibody syndrome, chronic anemia).
4. Active vaginitis.
5. Known precancerous cervical lesion, cervical cancer, or cervical screening within the last 3 years.
6. History of subfertility and conception by assisted reproductive technique (ART).

The sample size was calculated using the formula: $n=(Z^2*P*(1-P))/d^2$, where, Z=1.96 (95% confidence interval), P=prevalence of abnormal cytology in pregnancy=4.9% (from Suzuki S et al., Japan 2019[7]), d=Margin of error=5% (0.05) and $n=(1.96^2*0.049*0.951)/(0.05)^2$ =71.57. Accounting for a 5% non-response rate (4 participants), the final target sample size was 78. After obtaining written informed consent, eligible participants underwent speculum examination without antiseptic solution. Cervical samples were collected using a cytobrush rotated 5 times, suspended in methanol-based preservative for liquid-based cytology (LBC), and processed to create monolayered slides. Slides were stained, screened by trained cytotechnicians, and reviewed by a consultant cytopathologist. Results were reported per the Bethesda System 2014.[8,10] Inflammatory smears received antibiotic treatment at follow-up. Demographic and clinical data included age, age at marriage, gravidity, gestational age, socioeconomic status (modified Kuppuswamy scale[9] : Upper class (26–29), Upper Middle (16–25), Lower Middle (11–15), Upper Lower (5–10), Lower <5, smoking history, and pre-pregnancy contraception use. Data were analyzed using SPSS 20.0. Descriptive statistics (frequencies, percentages) summarized demographics. Categorical variables were compared using Chi-square tests, with statistical significance set at p-value<0.05.

RESULTS

All 78 participants completed the study. Cytology results indicated abnormalities in 58 women (74.40%), while 20 (25.60%) were NILM (Figure 1). Among abnormal findings inflammatory changes were most frequent (29, 37.2%), followed by bacterial vaginosis (12, 15.4%), Trichomonas vaginalis (12,

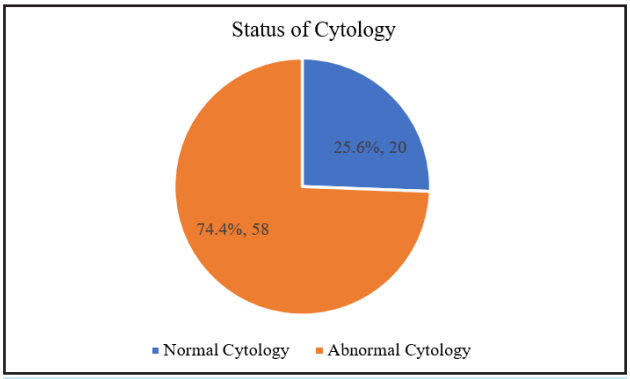

Figure 1. Status of cytology among study patients. (n=78)

15.4%), and candidiasis (5, 6.4%). No premalignant or malignant lesions were detected (Figure 2).

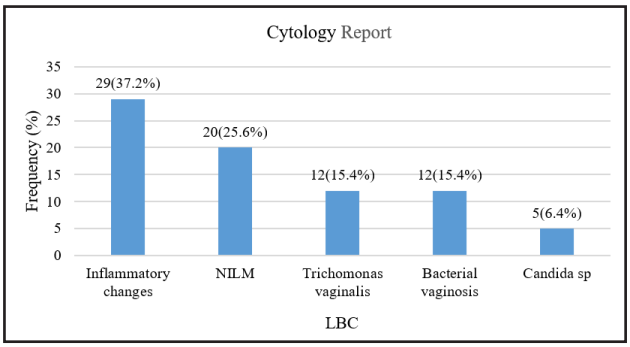

Figure 2. Distribution of cytology reports. (n=78)

Most participants (62, 79.5%) were aged 30–34 years. Age distribution did not differ significantly between normal and abnormal cytology groups (p-value=0.564). Residence: Women from rural backgrounds (54) showed a significantly higher prevalence of abnormal smears (40/54, 74.1%) compared to urban women (18/24, 75.0%; p-value<0.05). Socioeconomic Status: Half of the participants (39, 50.0%) belonged to the lower class, among whom abnormal smears were most prevalent (31/39, 79.5%; p-value=0.514). (Table 1)

Abnormal smears were more common in women married before age 25 (40/58, 69.0%) compared to those married later (18/58, 31.0%). The incidence of inflammatory changes, BV, and TV decreased with increasing age at marriage (Table 2, p-value>0.05 for specific findings).

Abnormal smears were most frequent among previous Copper-T users (16/20, 80.0%), followed by barrier method users (9/13, 69.2%) and OCP users (4/6, 66.7%; p-value=0.873, Table 1).

Table 1. Demographic and clinical characteristics of the patient with cytology report. (n=78)

Variables	Normal (n=20)	Abnormal (n=58)	p-value
Age group (years)			
30–34	15(75.0%)	47(81.0%)	0.564
35–39	5(25.0%)	11(19.0%)	
Age at marriage			
<20	5(25.0%)	19(32.8%)	0.159
20–24	5(25.0%)	21(36.2%)	
25–29	6(30.0%)	15(25.9%)	
30–34	4(20.0%)	2(3.4%)	
35–39	-	1(1.7%)	
POG (weeks)			
20–22	6(30.0%)	22(37.9%)	0.246
23–25	3(15.0%)	16(27.6%)	
26–28	11(55.0%)	20(34.5%)	
Parity			
Primigravida	6(30.0%)	12(20.7%)	0.394
Multigravida	14(70.0%)	46(79.3%)	
Socioeconomic condition			
Upper	2(10.0%)	3(5.2%)	0.514
Middle	10(50.0%)	24(41.4%)	
Lower	8(40.0%)	31(53.4%)	
Contraception method			
OCP	2(10.0%)	4(6.9%)	0.873
Barrier	4(20.0%)	9(15.5%)	
Copper T	4(20.0%)	16(27.6%)	
None	10(50.0%)	29(50.0%)	

Multigravida exhibited a higher prevalence of abnormal cytology (46/60, 76.7%) compared to primigravida (12/18, 66.7%; p-value=0.394). Gestational Age & Cervical Appearance: Gestational age did not significantly influence cytology results (p-value=0.246, Table 1). Women with cervical discharge (32) or erosion (12) had higher abnormal smear rates (25/32, 78.1%; 11/12, 91.7%) than those with a healthy cervix (22/34, 64.7%). No participants reported a smoking history.

DISCUSSION

The Pap smear remains a vital, cost-effective tool for cervical cancer prevention, yet community awareness in LMICs like Nepal remains critically low.

Table 2. Distribution of the study participants based on their age at marriage and the cytology report. (n=78)							
LBC	Age at Marriage (years)					p-value	
	<20	20-24	25-29	30-34	35-39		
NILM	5(20.8%)	5(19.2%)	6(28.6%)	4(66.7%)	-	0.159	0.35
Trichomonas vaginalis	3(12.5%)	5(19.2%)	2(9.5%)	1(16.7%)	1(100.0%)	0.164	
Bacterial vaginosis	5(20.8%)	6(23.1%)	1(4.8%)	-	-	0.306	
Inflammatory changes	10(41.7%)	8(30.8%)	10(47.6%)	1(16.7%)	-	0.506	
Candida sp.	1(4.2%)	2(7.7%)	2(9.5%)	-	-	0.896	

Antenatal care offers a unique opportunity to screen reproductive aged women who might otherwise lack access. While widespread pap testing programs have dramatically reduced cervical cancer rates in high-income countries since the mid-20th century.[10] Nepal continue to face a high burden, with incidence far exceeding the WHO targets of 4 per 100,000 women.[2] Antenatal cytology safely detects both pre-invasive lesions and asymptomatic infections that could adversely impact pregnancy outcomes if untreated.[11] This is particularly crucial in setting like Nepal, where a recent study by Pathak et al. (2025) highlighted that over 61.4% of women had never undergone cervical screening emphasizing the critical role of opportunistic screening.[12]

This study revealed a strikingly high prevalence of abnormal cervical cytology (74.4%) among pregnant Nepalese women aged 30-39 years, primarily driven by inflammatory changes (37.2%), bacterial vaginosis (15.4%), and trichomoniasis (15.4%). The predominance of infections aligns with studies in similar LMIC contexts. Ethirajan et al. (India, 2018) also reported a high abnormality rate (77%), predominantly inflammation)[6] Similarly, a recent Nepalese study by Shrestha S et al. (2022) found a high prevalence of cervicovaginal infections (42.7%) among women with gynecological complaints, though not exclusively antenatal.[2] However, our findings contrast with studies reporting lower overall abnormality rates, such as Mukhtar et al. (Malaysia, 2023: 30.3% infection, 0.8% premalignant)[13] and Suzuki et al. (Japan, 2019: 4.9% abnormal)[7], underscoring the significant regional variation and the specific vulnerability of the studied population in Nepal. The absence of premalignant lesions in our cohort, potentially reflecting our smaller sample size or differing population risk profiles.

While countries with established screening programs (e.g., UK, via NHS) generally avoid routine antenatal cytology due to technical challenges and deferred treatment feasibility however screening is strongly recommended during pregnancy in regions lacking organized screening and for under-screened women.[14] The American College of Obstetricians and Gynecologists (ACOG) explicitly advises Pap testing at the first prenatal visit for women who are due for screening or have inadequate screening history.[15] Our findings strongly support implementing this approach in Nepal.

Key risk factors identified in this cohort include rural residence, lower socioeconomic status, younger age at marriage (<25 years), multigravidity, and prior intrauterine device (copper-T) use. The association with rural residence and lower SES reflects barriers to healthcare access and education, corroborating findings by Shrestha et al.[16] and Arora et al.[17] The link between early marriage and abnormal cytology aligns with global evidence implicating early sexual debut as a major risk factor.[18] The higher prevalence among multigravida (79.3%) is consistent with parity as an established risk factor.[19] While the association with copper-T use require further investigation, it may relate to altered cervical microenvironment or selection bias.[14]

The high burden of treatable infections (BV: 15.4%, TV: 15.4%) identified underscores the antenatal Pap smear's clinical utility beyond cancer screening. Diagnosing and treating these conditions during pregnancy can potentially improve outcomes, as BV and TV are associated with adverse events like

preterm birth and PROM.[19] Integrating LBC screening into antenatal care thus offers a dual benefit: cancer prevention and infection management.

Limitations

This study has limitations: a relatively small sample size (n=78), restriction to women at 20-28 weeks gestation, and reliance solely on LBC without HPV co-testing. Larger, longitudinal studies incorporating HPV testing and extended gestational periods are warranted.

CONCLUSIONS

The rising incidence of cervical cancer necessitates proactive strategies for early detection of pre-malignant conditions. In LMICs with limited screening infrastructure, antenatal care represents a vital, often singular, opportunity to implement cervical cytology screening for underserved women. This study confirms a high prevalence of abnormal cytology (primarily infections) among pregnant Nepalese women and identifies key associated risk factors (rural residence, lower SES, early marriage, multigravidity, IUD use). Pap smear testing is safe, cost effective, and feasible during pregnancy. Integrating routine cervical screening into antenatal protocols, coupled with targeted patient education and follow-up for high-risk individuals, is essential for reducing the burden of preventable cervical cancer in Nepal and similar settings.

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