

## Papanicolaou smear as a tool for detection of Cervico-vaginal Infections in a Rural Tertiary care centre of Northern India: Retrospective analysis

Naina Kumar<sup>1,\*</sup>, Prem Singh<sup>2</sup>, Samar Rudra<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>3</sup>Professor & HOD, Dept. of Obstetrics & Gynecology, <sup>2</sup>Professor, Dept. of Pathology, MM Institute of Medical Sciences & Research, Ambala

**\*Corresponding Author:**

Email: drnainakumar@gmail.com

### Abstract

**Background:** The Papanicolaou test (Pap test) is most sensitive and widely used screening test for early diagnosis of various cervical lesions including infections.

**Objectives:** To know the utility of Pap smears in diagnosing cervical infections and to study the pattern of infections on Pap smears occurring in this region of India.

**Material and Methods:** Retrospective analysis of Pap smear reports of 5725 women who attended the Out Patient Department of Obstetrics and Gynecology with various complaints and for routine Pap smear screening during the period of January 2010 to December 2015 were collected from the Pathology Department of a rural tertiary care centre of Northern India after proper Institutional Ethical approval. The reporting of Pap smears was done by Bethesda 2001 system and by wet mount preparation of slides for diagnosis of various infections. Final analysis of data was done by using SPSS-20 version software.

**Results:** Of 5725 Pap smears examined retrospectively, 4448 (77.69%) cases were benign epithelial patterns, 580 (10.13%) abnormal epithelial patterns and remaining 697 (12.17%) were unsatisfactory. Of 4448 benign cases, 1292 had infectious patterns on Pap smear with bacterial vaginosis (68.73%) being most common followed by Trichomoniasis (20.05%) and candidiasis (11.07%). HPV infection was noted in only 2 cases (0.15%). Majority of women belonged to 41-50 years of age group.

**Conclusion:** Pap smear is one of the most simple and quick test for diagnosing cervical infections. However, for confirmation of Pap smear reports for infections, other tests like vaginal culture are required.

**Keywords:** Bacterial vaginosis; Candidiasis; Cytology; Infection.

### Introduction

Cervical infections are one of the commonly encountered problems in women of reproductive age group. They usually present with white discharge, foul smelling odor and pruritis.<sup>(1)</sup> Also vaginal discharge or leucorrhoea is the commonest complaint seen in women reporting to gynecological Out- Patient Department, especially in Indian scenario due to poor genital hygiene.<sup>(2)</sup> Not every woman with vaginal discharge has vaginitis; only about 40% of women with vaginal symptoms have some type of vaginitis.<sup>(3,4)</sup> It has been noted that many women remain asymptomatic even in presence of vaginitis or cervicitis.<sup>(1,5)</sup> Normally Lactobacilli have a protective effect on vaginal microenvironment, but still many other microorganisms can also be cultivated from vagina of healthy women. These organisms usually do not cause pathological state, but when one of them dominates, it results into vaginitis/vaginosis.<sup>(4,6)</sup>

The common agents causing vaginitis include anaerobic bacteria leading to bacterial vaginosis (BV), vulvovaginal candidiasis and trichomonal vaginitis.<sup>(3,4)</sup> The uncommon causes include atrophic vaginitis, foreign body with secondary infection, inflammatory vaginitis, Group A streptococcal vaginitis, *Staphylococcus aureus* associated ulcerative vaginitis and idiopathic vulvovaginal ulceration due to human immunodeficiency virus (HIV).<sup>(4)</sup>

Most of these infections can be easily diagnosed on routine Pap smear examination. Pap smear is a simple, quick, painless, routine screening test used for the detection of cervical abnormalities and precancerous dysplastic changes of the uterine cervix.<sup>(7,8)</sup> It can also be used for diagnosing cervico-vaginal infections due to bacterial, fungal, candidal infections.<sup>(9)</sup> There is also huge evidence that Pap smears are very beneficial in detecting infections that are risk factors for cervical cancer, such as human papilloma virus (HPV).<sup>(10)</sup>

Hence, this study was conducted to know the utility of Pap smear in diagnosing cervico-vaginal infections and to study the pattern of infections occurring in this region of India.

### Material and Methods

The present study was retrospective analysis of Pap smear reports of 5725 women who reported to the Obstetrics and Gynecology outpatient department of a rural tertiary care centre of Northern India during the period January 2010 to December 2015. For Retrospective analysis the data was collected from the record registers of Pathology Department after proper Institutional ethical clearance. Identity of any of the women was not unveiled during the study. All women of 21 years or more, married and or sexually active that had undergone Pap smear testing during this period were included in the study. Pap smears were taken for all women who reported to the out-patient department

of Obstetrics and Gynecology with complaints of white discharge per vaginum, post-coital bleeding, irregular menses, and pain in lower abdomen as well as those who had no complaints and had come for routine cervical screening.

Samples taken from in and around the cervix with Ayre's spatula were smeared on glass slides, fixed in alcohol fixative, stained with Papanicolaou stain (Pap stain). The slides were then examined under light microscopy and were reported using Bethesda 2001 system. If on examination, multiple small coccobacilli with conspicuous absence of lactobacilli were found, then the smear was reported as positive for bacterial vaginosis. While taking Pap smear a simultaneous wet film examination was also performed. For this, cervical smear was taken with Ayre's spatula and spread on clean glass slide. A drop of normal saline was put on it and covered with cover slip, followed by examination first under low power and then under high power for identification of *Trichomonas vaginalis* (motile and flagellated), *Candida* (branched or pseudo-hyphae) and viruses (HPV).

## Result

A total of 5725 Pap smear samples were retrospectively analyzed. Majority (37.35%) of the women belonged to 41-50 years age group as shown in Table 1. Of total 5725 samples analyzed 4448 (77.69%) had benign epithelial patterns with infectious smears accounting for 1292 (29.05%) cases. Abnormal epithelial patterns were seen in 580 (10.13%) cases and remaining 697 (12.17%) cases had unsatisfactory smears due to many reasons.

**Table 1: Age wise distribution of total number of cases**

Age Group (years)	No. of cases	Percentage
21-30	228	3.98%
31-40	1424	24.87%
41-50	2138	37.35%
51-60	1221	21.33%
61-70	455	7.95%
>70	259	4.52%
Total	5725	100%

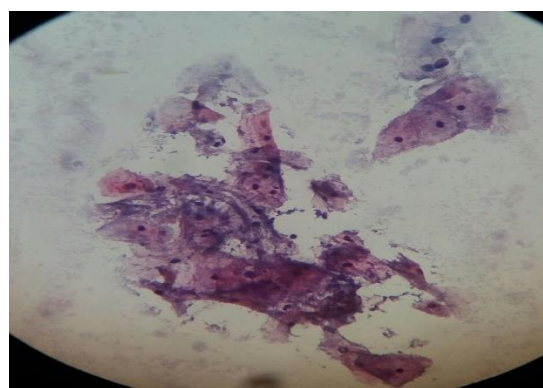
Of total 1292 cases with infectious patterns, 888 cases (68.73%) had Bacterial vaginosis; 143 (11.07%) Candidiasis; 259 (20.05%) Trichomoniasis and remaining two cases (0.15%) had Human Papilloma Virus (HPV) related changes, identified by presence of Koilocytes. Hence, it was observed that Bacterial vaginosis was the most common infectious pattern

observed on Pap smear followed by *Trichomonas* infection (Table 2).

**Table 2: Cytological findings of 5725 conventional smear samples**

Finding on Pap Smear	Number of cases (%)
Satisfactory	5028 (87.82%)
Unsatisfactory	697 (12.17%)
Negative for Intraepithelial Lesion or Malignancy	4448 (77.69%)
Normal	855 (14.93%)
Inflammatory	1728 (30.18%)
Infections	1292 (22.57%)
Bacterial Vaginosis	888 (68.73%)
Candidiasis	143 (11.07%)
Trichomonal Infections	259 (20.05%)
HPV infections	02 (0.15%)
Atrophic smears	555 (9.69%)
Epithelial cell abnormalities (ASCUS, AGC, LSIL, HSIL, etc.)	580 (10.13%)
Total	5725

Maximum cases of infectious smears were seen in 41-50 years age group women (Table 3). Also Bacterial vaginosis and Candidiasis were most commonly observed amongst 41-50 years age group females followed by 31-40 years, whereas *Trichomonas* infections was most commonly reported in 31-40 years females (Table 3).



**Fig. 1: Slide showing presence of Bacterial vaginosis (Pap, 400X)**

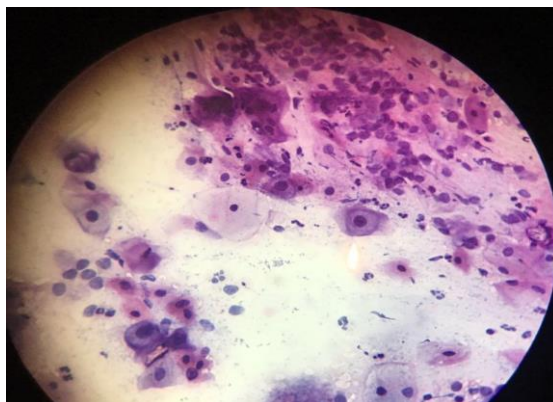


Fig. 2: Shows presence of Koilocytes, suggestive of Human Papilloma Virus infection (Pap, 400X)

Table 3: Age wise distribution of various lesions on Pap smear

Age (yrs) Lesion	21-30	31-40	41-50	51-60	61-70	>70	Total
Normal	53 (0.92%)	255 (4.45%)	351 (6.13%)	180 (3.14%)	14 (0.24%)	02 (0.03%)	855 (14.93%)
Inflammatory	54 (0.94%)	484 (8.45%)	777 (13.57%)	346 (6.04%)	55 (0.96%)	12 (0.20%)	1728 (30.18%)
Infections	88 (1.54%)	468 (8.17%)	519 (9.06%)	186 (3.25%)	24 (0.42%)	07 (0.12%)	1292 (22.57%)
Bacterial vaginosis	64 (1.12%)	304 (5.31%)	368 (6.43%)	131 (2.29%)	16 (0.28%)	05 (0.08%)	888 (15.51%)
Candidiasis	11 (0.19%)	43 (0.75%)	58 (1.01%)	23 (0.40%)	06 (0.10%)	02 (0.03%)	143 (2.50%)
Trichomoniasis	13 (0.23%)	121 (2.11%)	92 (1.60%)	31 (0.54%)	02 (0.03%)	00 (00%)	259 (4.52%)
HPV	00 (00%)	00 (00%)	01 (0.01%)	01 (0.01%)	00 (00%)	00 (00%)	02 (0.03%)
Atrophic	00 (00%)	21 (0.37%)	43 (0.75%)	171 (2.99%)	197 (3.44%)	123 (2.15%)	555 (9.69%)
Epithelial cell abnormalities	05 (0.09%)	74 (1.29%)	199 (3.48%)	150 (2.62%)	86 (1.50%)	84 (1.47%)	580 (10.13%)
Unsatisfactory	23 (0.40%)	123 (2.15%)	247 (4.31%)	190 (3.32%)	81 (1.41%)	33 (0.58%)	697 (12.17%)
Total	223 (3.89%)	1425 (24.89%)	2136 (37.31%)	1223 (21.36%)	457 (7.98%)	261 (4.56%)	5725

## Discussion

Worldwide infectious vaginitis is one of the most common problems faced by women reporting to Gynecology OPD.<sup>(1)</sup> Though Pap smear is a commonly used screening technique for diagnosis of precancerous and cancerous lesion,<sup>(7,8)</sup> it can also be used for diagnosing cervico-vaginal infections,<sup>(11)</sup> since while reporting cervical Pap smear results, a remark is usually made on the possible presence of infection based on cytological criteria.<sup>(12)</sup>

In our study it was observed that 42.78% (1292/3020) of all inflammatory smears had infections of cervix or vagina on Pap smear. Similar results were reported by Kelly and Black who found that 47% of all women with inflammatory changes on cervical smear testing had a microbiologically proven infection.<sup>(13)</sup>

Another similar study also demonstrated that the prevalence of infection was higher in the inflammatory smear group, indicating that women with inflammatory smear are more likely to harbor genital tract infection than women whose smear shows no evidence of inflammation.<sup>(14)</sup> On contrary to this, Bertolino et al. reported that inflammation on Pap smear had a very low predictive value for vaginal pathogens in asymptomatic women.<sup>(12)</sup> Similarly Parsons et al. reported that inflammation on Pap test is a poor indicator of cervical infection.<sup>(15)</sup>

The overall incidence of infectious vaginitis on Pap smear in our study was 22.57% (1292/5725) as compared to 50.07% reported by a similar study.<sup>(16)</sup> Whereas the Western literature report an incidence of infections on Pap smear around 38.3%.<sup>(1)</sup> Various

studies reveal that the most common microbial agents responsible for 90% of infectious vaginitis are the organisms causing Bacterial vaginosis, Candida species, and Trichomonas vaginalis.<sup>(17)</sup> Our study also found similar pattern of infections on Pap smear with bacterial vaginosis (68.78%) being most common followed by Trichomonas infection (20.05%) and candidiasis (11.07%) of total 1292 cases with infections on Pap smear. HPV infection related changes were observed in only two cases (0.15%). Another study also reported same pattern of infections with predominance of bacterial vaginosis on Pap smear.<sup>(16)</sup>

In our study bacterial vaginosis was found in 15.51% of all 5725 Pap smear reports observed which is comparable to other studies which reported the incidence of bacterial vaginosis about 18.34%<sup>(17)</sup> and 13.9%.<sup>(11)</sup> Another study by Bukhari et al<sup>(11)</sup> reported a higher incidence of bacterial vaginosis of around 75.7%.

The incidence of candidiasis in our study was 2.50% of all cases. Another similar study reported candidiasis in 11.16% of total population observed.<sup>(16)</sup>

In our study Trichomoniasis was observed in 4.52% of all Pap smears analyzed, which is similar to a study which reported the incidence of Trichomoniasis as 5.90%.<sup>(16)</sup> Bukhari et al<sup>(11)</sup> also reported the incidence of Trichomoniasis as 7.3% on Pap smear.

Similarly another study comprising of 9,080 patients reported that of 1733 women (19.08%) with lower genital tract infection on Pap smear; 33.5% had bacterial vaginosis, 30.4% trichomonas vaginalis, 43.3% candida, and 0% actinomycetes.<sup>(18)</sup>

As compared to our study a study by Sullam et al<sup>(19)</sup> reported an overall prevalence of infectious vaginitis of 52.8% with Candida albicans in 28% cases, Trichomonas vaginalis 8.7%, Aspergillus species 7.4%, streptococci 4.6% and Chlamydia trachomatis in 4.2% of cases.

Also in our study bacterial vaginosis and candidiasis were observed most commonly among 41-50 years females and Trichomonas infection in 31-40 years women, whereas a similar study reported that Trichomonas infection was more common in postmenopausal women and candida infection in reproductive age group females.<sup>(18)</sup>

Hence, it was found that Pap smear is a simple, quick test that can be used for diagnosing cervical infections in addition to precancerous and cancerous lesions.

## Conclusion

Pap smear is a simple and cost effective technique for diagnosis of cervico-vaginal infections also. Though the sensitivity and specificity of Pap smear in diagnosing infection is low compared to vaginal culture, but still it can be effectively used as a preliminary test with findings further confirmed by culture and gram staining.

## Limitations

The present study was a retrospective study, in future we can try to do a prospective study with vaginal culture in addition to Pap smear. As Pap smear is a less sensitive test for diagnosing cervico-vaginal infections, its findings need to be further confirmed with culture of organism which is highly specific and sensitive.

## Acknowledgement

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## Conflicts of Interest

There are no conflicts of Interest.

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