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Original Research Article

# Correlation of vaginal pH, cytology and vaginal maturation value in diagnosis of atrophic vaginitis in post menopausal women

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**Abstract:** The objective of this study is to detect the correlation among vaginal pH, cytology and vaginal maturation value (VMV) in diagnosis of atrophic vaginitis in postmenopausal women. 100 women were enrolled out of which 49 were symptomatic having symptoms of atrophic vaginitis and 51 postmenopausal otherwise healthy women who had no symptoms of atrophic vaginitis. All women underwent vaginal pH, cytology and vaginal maturation value assessment in addition to routine history and examination. In women with atrophic symptoms, age and duration of menopause was significantly higher than women without this symptoms. There was highly significant correlation was found between vaginal pH and parabasa cells. Similarly highly significant inverse correlation was detected between vaginal pH and VMV. This study confirms that high vaginal pH is associated with elevated parabasal cells and low vaginal maturation value in postmenopausal women of atrophic vaginitis.
**Keywords:** atrophic vaginitis, menopause, pH, vaginal maturation value, parabasal cell.

## INTRODUCTION

Menopause is a universal phenomenon and principal health concern of menopausal women includes vasomotor symptoms, atrophic vaginitis, osteoporosis, cardiovascular disease, cognitive decline and sexual problems [1]. Atrophic vaginitis is inflammation of vagina due to thinning and shrinking of vaginal tissue as well as decrease lubrication, which is caused by decreased level of estrogen. Declining level of estrogen; increases tissue fragility , urogenital infection, vaginal dryness and vaginal tissue trauma [2]. 10-40% of patients experience urogenital atrophy after menopause although only 25% of these reports with symptom to the gynaecologist. Generally the prevalence of vaginal atrophy has been reported to range from 7% to 57% in healthy peri and post menopausal women. Approximately 40% of women with vaginal atrophy reports dyspareunia [3-5].

Estrogen deficiency may cause reduction in superficial epithelial cells and increment of parabasal cells in the vagina. It also results in less exfoliation of cells which leads to less release of glycogen and reduced conversion to lactic acid by the vaginal flora3. Lactic acid maintains the vaginal pH at about 3.5to 4.5 [6]. This acidic pH is an important component of a women´s non specific defense against pathogens [7]. Vaginal pH is increased in postmenopausal women. The weighted average of vaginal pH is 6in post menopausal women not receiving estrogen therapy [8]. Vaginal maturation value (VMV) is calculated from the ratio of superficial, intermediate and parabasal cells count in vaginal smear which is used to detect vaginal atrophy and estrogen deficiency in post menopausal women [9].

So, in present study, we are presenting the correlation between vaginal pH, cytology and VMV in post menopausal women.

## METHODS

Hundred post menopausal women attending gynecology OPD, KGMU, Lucknow were included in the study. Detailed history and examination of all patients was done. Demographic characteristics including age, religion, socio-economic status, education, parity werenoted. Symptoms of atrophic vaginitis such as dryness, itching, burning, soreness, discharge per vaginum, dyspareunia, burning micturition, painful micturition and incontinence were enquired. Women declining consent to enroll in study,

having infection of vagina, malignancies of genital tract, women with systemic diseases, Previous vaginal surgery involving more than 1/3rd of vagina, positive amine test and women with history of current or past exposure to estrogen progestrone replacement or vaginal estrogen therapy were excluded. In addition all women underwent vaginal pH measurement and vaginal smear was taken for cytology and maturation value assessment.

**PH estimation**: Vaginal pH level was measured by pH indicator paper with colour scale which range from pH 2 to 10.5 developed by Merck specialities Pvt. Ltd. This device is composed of foils containing Nitrizine yellow for pH testing. Paper is contacted to vagina for 5 seconds and colour is compared with colour scale and thus pH value is determined.

**Cytology Evaluation**: Cytological evaluation was performed by vaginal smear collected from lateral wall of mid third of vagina and mounted on a slide. Smear is immediately fixed in an alcohol ether dip for 1 hour and then stained with Papanicoloau stain. Each slide is evaluated in department of Pathology, KGMU Lucknow. In a total of 100 exfoliated vaginal cells, parabasal cells, intermediate cells, superficial cells were counted and results were expressed as the maturation value [9]. Parabasal cell are small rounded cell with large nuclei comprising50 – 70% of the total cell size. Intermediate cell have small nuclei with round cell. Superficial cells have smallernuclei, rectangular cell membrane with abundant cytoplasm with nucleous comprising 10 – 20% of the cell.

Superfecial cells, Intermediate cellsand parabasal cells were assigned a point value of 1, 0.5 and 0 respectively. The number of cells in each category will be multiplied by point valuesand all three results will be added to arrive at a maturation value. A value of 0-49 indicates low estrogen effect. Value of 50 – 64 indicate moderate estrogen effect and value of 65 –100 indicate high estrogen effect [9]. All examination will be interpreted by same pathologist without prior knowledge of subject data.

**Statistical Analysis**:

The statistical analysis was done using SPSS version 15.0 statistical analysis software. The value was represented in number (%), mean + SD and p value.

**RESULTS**

Out of 100 women enrolled, 49 were symptomatic and 51 were having no symptoms of atrophic vaginitis. The most common symptoms were dryness (98%), itching (89.8%), burning (61.2%) and dyspareunia (32.7%). Other less common symptoms were burning and increased frequency of micturation, discharge per vaginum and prolapse. Mean age in symptomatic and asymptomatic women was 55.35 + 7.03 and 50.99 + 4.83 years respectively which was statistically significant (p=0.007). Mean duration of menopause in symptomatic women was 7.33 + 6.03 while in asymptomatic women it was 4.33 + 3.28 which was also statistically significant($p<0.001$). There was no significant difference between groups regarding parity and body mass index (BMI) (table 1).

Majority of symptomatic women (30.6%) had vaginal pH range from 6- 7 as compared to asymptomatic women in which most women (54.9%) had vaginal pH range 5.1–6. Mean pH in symptomatic and asymptomatic women was 6.67+0.95 and 5.49+0.75 respectively, which was statistically significant ($p < 0.001$) (table 2).

Mean parabasal cell count was 2.31 + 3.27 in symptomatic women but asymptomatic women had no parabasal cells which was also statistically significant ($p < 0.001$). Intermediate cell count is more in symptomatic women while superficial cell count was maximum in asymptomatic women and difference of cell counts was found statistically significant in both groups ( $p <0.001$). Mean VMV in symptomatic and asymptomatic women was 56.65 + 6.14 and 84.12 + 11.08 respectively and difference was found to be statistically significant ($p<0.001$) (table 3).

No subjects having VMV <49 had pH <5 and no subjects with VMV >65 had pH >8. Mean pH in VMV category <49, 50 – 64 and >65 was 7.82+0.85, 6.28 + 0.79 and 6.02 + 0.82 respectively which was found to be statistically significant. In this study 28 women (60.8%) with VMV >65 had pH < 6 and 10 out of 13 (76.9%) patients with severe atrophic vaginitis (VMV < 49) had pH >7 while 10 out of 41 women (23.8%) with mild atrophic vaginitis (VMV 50-64) had pH above 7, suggesting women with high vaginal pH had low VMV score (table 4). Significant inverse correlation was found between vaginal pH and VMV ($p<0.001$).

**Table 1: Demographic Profile of Menopausal women**

| | Symptomatic (n=49) | Asymptomatic (n=51) | P value |
|---|---|---|---|
| Mean Age | 55.35 + 7.03 | 50.99 +_ 4.83 | 0.007 |
| Mean Duration of menopause | 7.33 +6.03 | 4.33+ 3.28 | 0.001 |
| Mean Parity | 3.4 +2.1 | 3.6 +2.2 | 0.13 |
| Mean BMI | 21.67 + 1.73 | 21.27 +1.59 | 0.603 |

**Table2: Distribution of pH in menopausal women**

| Ph | Symptomatic (n=49) | Asymptomatic (n=51) | P value |
|---|---|---|---|
| 4.5 – 5 | 6(12.2%) | 14(27.5%) | P<0.001 |
| 5.1 – 6 | 13(26.5%) | 28(54.9%) | |
| 6.1 – 7 | 15(30.6%) | 08(15.7% | |
| 7.1 – 8.0 | 10(20.4%) | 1(2%) | |
| >8 | 5(10.2%) | | |
| Mean pH of all women 6.08+10.41 | 6.67 + 0.95 | 5.49+0.75 | |

**Table 3: Comparison of cytology in menopausal women**

| Findings | Symptomatic (n=49) | | Asymptomatic (n=51) | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Parabasal cells | 2.31 | 3.27 | 0.0 | 0.0 | <0.001 |
| Intermediate cells | 79.06 | 16.33 | 31.65 | 21.98 | |
| Superficial cells | 18.53 | 17.92 | 68.38 | 21.96 | |
| VMV | 56.65 | 6.14 | 84.12 | 11.08 | |

**Table 4: Correlation of pH and VMV in menopausal women**

| pH | VMV Category | | |
|---|---|---|---|
| | VMV<49 (n=13) | VMV 50-64 (n=41) | VMV >65 (n=46) |
| 4.5 – 5.0 | 0 | 04(9.8) | 03(6.5) |
| 5.1 – 6.0 | 2(23.1%) | 12(29.3%) | 25 (54.3%) |
| 6.1 – 7.0 | 1(7.7%) | 15(36.6%) | 17(37%) |
| 7.1 – 8.0 | 8(61.5%) | 8(19.5%) | 1(2.71%) |
| >8.0 | 2(15.4%) | 02(4.33%) | 0 |
| Mean pH | 7.82±0.35 | 6.28+ 0.79 | 6.0 + 0.82 |

**DISCUSSION**:

In our study there was significant correlation among age, duration of menopause and atrophic vaginitis but no significant difference was found regarding parity and BMI which is comparable to study done by Pinar Yoruket al in which women with atrophic symptoms, the age was higher than those without symptoms and no significant difference was found regarding parity and BMI [10]. Similarly in study done by Sebestian *et al.;* no significant difference of BMI was found [11]. While from previous studies it is known that BMI can influence serum estrogen (E2) value, vaginal pH and consecutively vaginal mucosal health [8].

In present study mean pH in symptomatic patients was significantly higher than asymptomatic patients.i.e. 6.67 + 0.95 and 5.49 + 0.75 respectively ( p<0.001) which is comparable to study done by Pinar Yoruk *et al.;* in which women with urogenitalatrophy had mean pH of 6.5±0.48 and was significantly higher than women without these symptoms [10]. Davila *et al.;* also demonstrated that vaginal pH is solid predictor of maturation value and most reliable indicator of urogenital atrophy [12]. Meta-analysis of 16 reports by Roy *et al.;* confirmed that vaginal pH reflects circulating estradiol level [18].Therefore with the use of vaginal pH value; it is possible to detect atrophic vaginitis.

In current study parabasal cells are present only in symptomatic women and mean was 2.31 + 3.27. A study done by Fantl *et al.;* showed that mean parabasal count in 70post menopausal women with urinary incontinence was 18 ± 27% which decrease to 0 + 1% on estrogen supplementation [13]. In this study, mean VMV in symptomatic women was significantly higher than women without atrophic vaginitis. Similarly, study done by Pinar Yoruk *et al.;* also represented that difference in mean VMV in symptomatic and asymptomatic women was 34.7±16.2 and 83.8±9.4 which was statistically significant [10].Vander Linden *et al.;* Notelovitz *et al.;* and Sartori *et al.;* also described on estrogen supplementation, number of parabasal cells decrease in postmenopausal women with atrophic vaginitis [14-16]. In symptomatic women 61.2% had vaginal pH above 6 while in asymptomatic only 17.6% had vaginal pH above 6. In women with elevated parabasal cell count, mean pH was 6.8 which is comparable to study done by Shawna Brizzolara *et al.;* which conclude vaginal pH above 6 significantly correlates with high level of parabasal cells (>20%) [17]. Hustin *et al.;* also noticed that increasing

age was associated with progressive decline in maturation value and higher parabasalcell [18].

In study done by Pinar Yoruk *et al.;* also, there was highly significant inverse correlation between vaginal pH and VMV (10). Thus vaginal MV is similar to vaginal pH in identification of patients with atrophic vaginitis even in presence of vaginal inflammation.

## CONCLUSIONS:

So in the present study we concluded that high vaginal pH is associated with elevated parabasal cell count and low vaginal maturation value (VMV) in post menopausal women of atrophic vaginitis.

## DECLARATIONS

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