



Obstetrics & Gynaecology

**A CROSS-SECTIONAL DESCRIPTIVE STUDY OF THE
ASSOCIATION OF VAGINAL pH AND VAGINAL MATURATION INDEX
WITH SYMPTOMS OF GENITOURINARY SYNDROME IN MENOPAUSAL
WOMEN IN DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY SMS
MEDICAL COLLEGE, JAIPUR**

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| Dr. Pratibha Yadav | III RD YEAR PG Student ,department Of Obstetrics And Gynaecology, SMS Medical College, Jaipur. |
| Dr. Megha Agrawal | Professor, Department Of Obstetrics And Gynaecology, SMS Medical College, Jaipur. |
| Dr. Nancy Todi | III RD YEAR PG Student, Department Of Obstetrics And Gynaecology, SMS Medical College, Jaipur. |

ABSTRACT **Aim And Objective:** To find out association of vaginal pH and vaginal maturation index with symptoms of genitourinary syndrome in menopausal women. **Material And Methods:** This was cross-sectional descriptive study conducted during September 2022 to October 2023 in department of obstetrics and gynaecology , SMS Medical College, Jaipur. The study included 102 women with menopause .Vaginal pH and vaginal maturation index calculated and symptoms of genitourinary syndrome were asked by a questionnaire. Hormonal levels (S.FSH and S. estradiol) were also done. **Results:** The findings demonstrate that elevated vaginal pH and decreased VMI has an association with more severe GSM symptoms. **Conclusion:** This study underscores the importance of assessing vaginal pH and VMI in postmenopausal women as part of a comprehensive strategy for managing GSM.

KEYWORDS : Menopause, genitourinary syndrome of menopause, vaginal pH and vaginal maturation index (VMI).

INTRODUCTION

Menopause is derived from the Greek word 'men' means month which is related to word moon and 'pausis' means to cease or stop'. Menopause is the physiological cessation of menstruation that denotes a normal human developmental phase in the life of woman'. Menopause is defined when there has been amenorrhoea (absence of any menstruation) for 1 complete year and very much elevated follicle stimulating hormone (FSH) level¹.

The transition into menopause marks a period of significant physiological changes due to declining estrogens levels, leading to the development of genitourinary syndrome of menopause (GSM)². There is a reduction in epithelial layer, vaginal secretion, musculature and vascularity thus led to GSM³. Vaginal pH becomes alkaline in menopause and can also be elevated by bacterial vaginosis, cervical mucus, semen, vaginal medication and douches. In the absence of vaginitis, vaginal pH of 6-7.5 strongly suggests menopause.

Estrogen levels leads to proliferation of superficial cells of vagina but during menopause estrogen levels are reduced and ratio of superficial cells and parabasal cells is altered which also leads to alteration of vaginal maturation index. GSM encompasses various symptoms affecting the urogenital system, with a profound impact on women's quality of life⁴. Despite its prevalence, GSM is underdiagnosed and undertreated, largely due to lack of awareness and standardized diagnostic criteria⁵. Previous studies have indicated that GSM symptoms correlate with hormonal changes; however there is limited research on the role of vaginal pH and VMI as diagnostic tools⁶.

This study aims to explore the relationship between GSM and measurable changes in vaginal pH and vaginal maturation index (VMI), along with hormonal variations, to enhance understanding and management of the condition.

MATERIAL AND METHODS:

This was a cross-sectional descriptive study conducted during September 2022 to October 2023 at Department of obstetrics and gynaecology, SMS Medical College, Jaipur.

The study involved 102 postmenopausal women and symptoms of GSM were asked. Vaginal pH and VMI were measured, and hormonal levels, including estradiol and follicle- stimulating hormone (FSH), were analyzed. Statistical analysis was used to find association between these variables and GSM symptoms.

Selection Criteria**Inclusion Criteria:**

Menopausal women of less than five years of menopause with intact uterus and atleast one ovary and who have given written informed consent.

Exclusion Criteria:

1. Vaginitis or active infection and women using vaginal medications and douches.
2. Sexual intercourse within previous three days.
3. Women on hormone therapy.
4. Genital malignancy, chemotherapy or radiotherapy.
5. Active smoker.

RESULTS:**Table No. 1: Demography Of Study Population**

| Variables | GSM Positive (n=74) | GSM Negative (n=28) | P value |
|-------------------------------|---------------------|---------------------|---------|
| Age | 50.79 ±2.72 | 50±2.91 | 0.2 |
| Duration of menopause (years) | 2.78±0.76 | 2.39±0.68 | <0.0001 |
| Parity | | | 0.99 |
| Nullipara | 2 | 1 | |
| Second para | 19 | 7 | |
| Multipara | 53 | 20 | |
| BMI | 23.05±1.16 | 23.04±1.18 | 0.8 |

Table No. 2 Distribution Of Study Population According To GSM Related Symptoms.

| Gsm Related Symptoms | Mild | | Moderate | | Severe | | P-Value |
|-------------------------------------|--------------|-------------|--------------|-------------|--------------|-------------|---------|
| | No. Of cases | Perce ntage | No. Of cases | Perce ntage | No. Of cases | Perce ntage | |
| Vaginal dryness | 34 | 33.33 | 43 | 42.16 | 18 | 17.65 | 0.0002 |
| Dyspareunia (sexually active n =73) | 41 | 40.2 | 29 | 28.43 | 3 | 2.94 | 0.18 |
| a. Superficial | 37 | 90.24 | 26 | 89.65 | 2 | 66.6 | 0.2 |
| b. Deep | 4 | 0.97 | 3 | 10.34 | 1 | 33.3 | 0.01 |
| Itching | 41 | 40.2 | 22 | 21.57 | 5 | 4.9 | 0.03 |
| Discharge | 2 | 1.96 | 0 | 0 | 0 | 0 | 0.1 |
| Difficulty during micturition | 39 | 38.24 | 9 | 8.82 | 0 | 0 | <0.0001 |

In the study of GSM (Genitourinary Syndrome of Menopause) symptoms, the distribution of cases across different severity levels is as follows: Vaginal dryness was reported in 34 cases as mild, 43 cases as moderate, and 18 cases as severe. Dyspareunia was observed in 41 cases as mild, 29 cases as moderate, and only 3 cases as severe, with superficial dyspareunia being more common (37 mild, 26 moderate) compared to deep dyspareunia (4 mild, 3 moderate). Itching affected 41 cases mildly, 22 cases moderately, and 5 cases severely. Discharge was reported only in 2 mild cases with no moderate or severe occurrences. Difficulty during micturition was noted in 39 cases as mild, 9 cases as moderate, and none as severe.

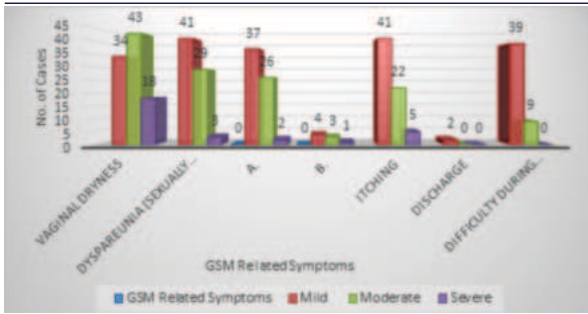


Table No. 3: Association Of Vaginal Cytology With GSM In Study Population.

| Parameter | Total | | GSM Negative (n=28) | | GSM Positive (n=74) | | P-value |
|--------------------------|-------|-------|---------------------|-------|---------------------|-------|---------|
| | Mean | SD | Mean | SD | Mean | SD | |
| Vaginal pH | 5.85 | 0.41 | 5.57 | 0.4 | 5.96 | 0.36 | <0.0001 |
| Vaginal maturation index | 51.74 | 6.64 | 56.71 | 5.44 | 49.86 | 6.08 | <0.0001 |
| a. Parabasal | 37.25 | 15.39 | 25 | 13.19 | 41.89 | 13.41 | |
| b. Intermediate | 46.12 | 16.95 | 58.21 | 16.56 | 41.55 | 14.8 | |
| c. Superficial | 16.61 | 6.89 | 16.78 | 7.48 | 16.55 | 6.71 | |

The table shows that the mean vaginal pH for the total population is 5.85, with GSM-negative cases having a slightly lower pH of 5.57 and GSM-positive cases having a higher pH of 5.96. The Vaginal Maturation Index (VMI) averages 51.74 overall, with GSM-negative cases showing a higher mean of 56.71 compared to 49.86 in GSM-positive cases. Within the VMI components, Parabasal cells constitute 37.25% overall, with a lower mean of 25% in GSM-negative and a higher mean of 41.89% in GSM-positive cases. Intermediate cells account for 46.12% overall, higher in GSM-negative cases at 58.21% compared to 41.55% in GSM-positive cases. Superficial cells are relatively consistent, averaging 16.61% overall, with GSM-negative at 16.78% and GSM-positive at 16.55%.

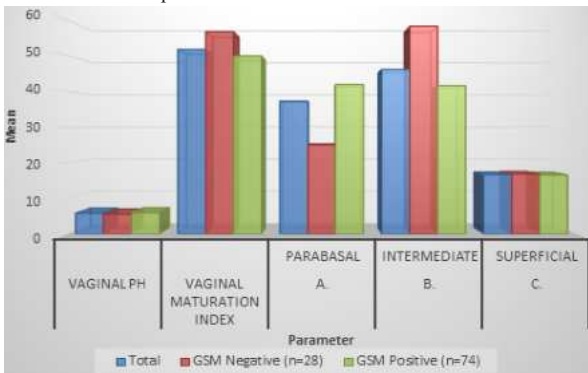


Table No.4 Association Of Serum Estradiol And Serum FSH Levels With GSM Symptoms In Study Population.

| Parameter | Total | | GSM Negative (n=28) | | GSM Positive (n=74) | | p-value |
|-----------------|-------|------|---------------------|------|---------------------|------|---------|
| | Mean | SD | Mean | SD | Mean | SD | |
| Serum FSH | 45.51 | 2.63 | 43.95 | 2.09 | 46.11 | 2.57 | 0.0001 |
| Serum estradiol | 12.32 | 1.4 | 13.13 | 1.05 | 12.01 | 1.40 | 0.0002 |

The mean serum FSH level for the total population is 45.51, with GSM-negative cases having a mean of 43.95 and GSM-positive cases having a mean of 46.11. For serum Estradiol, the mean level for the total population is 12.32, with GSM-negative cases showing a mean of 13.13 and GSM-positive cases showing a mean of 12.01.



Table No. 5 Association Between S.FSH And S. ESTRADIOL And Vaginal Cytology In Study Population.

| Parameter | S.FSH p-value | S. ESTRADIOL p-value |
|--------------------------|---------------|----------------------|
| Vaginal pH | 0.03 | 0.001 |
| Vaginal Maturation Index | <0.0001 | <0.0001 |

The serum FSH (follicle-stimulating hormone) and vaginal pH shows a positive association with a p-value of 0.03, indicating a statistically significant relationship. For serum estradiol, there is a negative association with vaginal pH that means when vaginal pH increases, estradiol levels decreases with a p-value of 0.001, indicating a statistically significant relationship. Regarding the vaginal maturation index, serum FSH is negatively associated with a highly significant p-value of <0.0001, that means when serum FSH levels increases (as expected in menopause), vaginal maturation index decreases (shift to left). While serum estradiol shows a strong positive association with a highly significant p-value of <0.0001.

DISCUSSION

Genitourinary syndrome of menopause has a major negative impact on a woman's wellbeing and quality of life. A lack of estradiol causes a variety of hormonal changes in the vaginal tract such as reduction in epithelial layer, vaginal secretion, musculature and vascularity thus led to GSM. In our study, we evaluated a total of 102 cases across different age groups Mean age of menopause was 50.57±2.79. In this study , most bothersome symptom was vaginal dryness followed by dyspareunia and difficulty during micturition. In our study, the overall mean for serum FSH levels, for the total population was 45.51, with GSM-negative cases averaging 43.95 and GSM-positive cases averaging 46.11. There is highly significant statistical difference with p value=0.0001. For serum estradiol levels, the mean for the entire population was 12.32, with GSM-negative cases showing a mean of 13.13 and GSM-positive cases showing a mean of 12.01. There is also statistically significant difference (p value=0.0002). **Lumbanraja I L et al.** reported that women with GSM had lower estradiol levels, with a median of 11.9 pg/mL (range: 11.7–108.4), compared to women without GSM, who had a median estradiol level of 13.2 pg/mL (range: 11.8–151.5). This difference was statistically significant with a p-value of 0.025.

Kaur K et al.¹⁰ found the mean FSH level in their study to be 55.73 ± 12.89 IU/L.

Here, in our analysis the GSM-positive cases a higher pH of 5.96; GSM-negative cases having a slightly lower pH of 5.57 (mean vaginal pH for the total population is 5.85). This shows highly significant statistical difference with p value <0.0001. The Vaginal Maturation Index (VMI) showing a lower mean of 49.86 in GSM positive cases compared to 56.71 in GSM negative cases (an overall average of 51.74). This also indicates highly significant statistical difference with p value <0.0001. Among the VMI components, parabasal cells make up 37.25% overall, with GSM-negative cases averaging 25% and GSM-positive cases averaging 41.89%. Intermediate cells constitute 46.12% overall, with GSM-negative cases at 58.21% and GSM-positive cases at 41.55%. The proportion of superficial cells remains fairly consistent, averaging 16.61% overall, with GSM-negative cases at 16.78% and GSM-positive cases at 16.55%.

Lumbanraja I L et al⁹ found that in their study of menopausal women, those with genitourinary syndrome of menopause (GSM) had a higher mean vaginal pH of 5.9 ± 0.52, compared to 5.1 ± 0.22 in those without GSM, with a p-value of 0.014. The Vaginal Maturation Index (VMI) also differed significantly between the groups (p < 0.001). Women with GSM had more parabasal cells (2.31 ± 3.2 vs. 1.15 ± 0.82) and intermediate cells (78.8 ± 15.9 vs. 30.55 ± 21.78), but fewer superficial cells (17.55 ± 18.9 vs. 68.35 ± 22.9). The overall VMI score was lower in the GSM group (51.86 ± 11.5) compared to the non-GSM group (62.22 ± 12.1). **Lumbanraja I L et al**⁹ also noted that vaginal pH values above 5 are generally associated with the presence of GSM in postmenopausal women.¹⁰ **Panda S et al**¹¹ reported a mean vaginal pH level of 5.3 ± 0.7, with a standard deviation of 0.71 (range 4.1-7).

Vahidroodsari F et al¹² found the mean vaginal pH to be 5.33 ± 0.53, ranging from 4.1 to 5.9. **Cailloutte et al.**¹³ evaluated vaginal pH and serum FSH levels in 172 postmenopausal women and reported a sensitivity of 88% for vaginal pH in predicting estradiol status. **Gow et al.**¹⁴ suggested that biochemical parameters alone cannot reliably confirm menopausal status or differentiate between early

postmenopausal and premenopausal phases. Additionally, age and reproductive stage are crucial determinants of FSH levels in US women, but FSH by itself has limited utility in distinguishing among different reproductive stages¹⁵.

Henceforth, in our study we found that there is strong positive association of vaginal pH (increases) and vaginal maturation index (decreases) with GSM (>2 symptoms present).

CONCLUSION:

Our study highlights the significant relationship between genitourinary syndrome of menopause (GSM) and changes in vaginal pH and Vaginal Maturation Index (VMI). The data demonstrate that higher vaginal pH and lower VMI are associated with GSM, which aligns with previous research. These findings suggest that monitoring vaginal pH and VMI, along with hormonal assessments, can be crucial in diagnosing and managing GSM. Hormone replacement therapy may be beneficial in restoring vaginal health and alleviating symptoms, enhancing overall quality of life for affected women.

REFERENCES:

1. Speroff L, Fritz MA. Menopause and the Perimenopausal Transition. *Clinical Gynaecology Endocrinology and Infertility*. Lippincott Williams and Wilkins. 2005; 7(17):621-688.
2. Howkins, Bourne Shaw's. *Textbook of Gynaecology*, Chapter 5 Page 61.
3. Harlow SD, Gass M, Hall JE, Lobo R, Maki P, Rebar RW, et al. Executive summary of the Stages of Reproductive Aging Workshop +10: Addressing the unfinished agenda of staging reproductive aging. *Fertil Steril* 2012;97:843-51.
4. Nappi, R. E., & Palacios, S. (2014).* "Impact of vulvovaginal atrophy on sexual health and quality of life at postmenopause." *Climacteric*, 17(Suppl 1), 3-9.
5. Identifying women's perceptions on vulvar and vaginal atrophy and its treatment. *J Sex Med* 2017;14(3):413-424.
6. Faubion, S. S., Sood, R., & Kapoor, E. (2017).* "Genitourinary syndrome of menopause: Management strategies for the clinician." *Mayo Clinic Proceedings*, 92(12), 1842-1849.
7. Paraiso, M. F. R., Creasman, S. D., & Woolfork, S. K. (2016).* "Evaluation and management of the genitourinary syndrome of menopause." *American Journal of Obstetrics and Gynaecology*, 215(6), 704-711.
8. Kingsberg, S. A., et al. (2013).* "Vulvar and vaginal atrophy in postmenopausal women: Findings from the REVIVE (REal Women's Views of Treatment Options for Menopausal Vaginal Changes) survey." *Journal of Sexual Medicine*, 10(7), 1790-1799.
9. Lumbanraja IL, Siregar MFG, Lumbanraja SN, et al. Association of Vaginal Maturation Index and Vaginal pH with the Most Bothersome Symptoms of Genitourinary Syndrome of Menopause. *J South Asian Feder Obst Gynae* 2021;13(5):288-291.
10. Fisher BK. Normal anatomy of the vulva. In: Fisher BK, Margesson LJ, editors. *Genital skin disorders: diagnosis and treatment*. St Louis, MO: Mosby; 1998. p. 99-107.
11. Panda S, Das A, Singh AS, Pala S. Vaginal pH: A marker for menopause. *J Mid-life Health* 2014;5:34-7.
12. Vahidoodsari F, Ayati S, Yousefi Z, Saeed S. Comparing Serum Follicle-Stimulating Hormone (FSH) Level with Vaginal PH in Women with Menopausal Symptoms. *OMJ*(2010);25:13-16.
13. Caillouette JC, Roy S, Roy T, Faden JS. Vaginal pH is similar to follicle-stimulating hormone for menopause diagnosis. *Am J ObstetGynecol* 2004;190:1272-7.
14. Gow SM, Turner EI, Glasier A. The clinical biochemistry of the menopause and hormone replacement therapy. *Ann Clin Biochem* 1994;31(Pt6):509-28.
15. Henrich JB, Hughes JP, Kaufman SC, Brody DJ, Curtin LR. Limitations of follicle-stimulating hormone in assessing menopause status: Findings from the National Health and Nutrition Examination Survey (NHANES 1999 2000)*. *Menopause* 2006;13:171-7.