Original Article

Association Between Vaginal Microbiota and Recurrence of Vaginal Infections at DHQ Hospital, Mirpur AJK

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ABSTRACT

Objective: The aim of this study was to thoroughly investigate the relationship between vaginal microbiota composition and the recurrence of vaginal infections.

Study Design: A cohort study was successfully conducted.

Place and Duration of Study: This study was conducted at the Department of Obstetrics and Gynaecology, DHQ Hospital & Mohtarma Benazir Bhutto Shaheed Medical College, Mirpur, AJK from 1st February 2023 to 30th January 2024.

Methods: A cohort study was conducted over 12 months to comprehensively investigate the microbiological profile and contributing factors for recurrent vaginal infections among 400 women aged 18–45 years. Participants were systematically recruited from gynecology clinics, and eligibility criteria required them to have experienced at least three episodes of vaginal infections in the past year. Women who were pregnant, breastfeeding, or had recently been treated with antibiotics or antifungal medications were strictly excluded.

Results: Significant differences were found in the vaginal microbiota of women with recurrent infections compared to those without recurrence. A significantly lower prevalence of Lactobacillus species ($p < 0.001$) was clearly observed in women with recurrent infections, while Gardnerella vaginalis (69% vs. 33%, $p = 0.004$) and Candida albicans (56% vs. 25%, $p = 0.002$) were found to be notably more prevalent in the recurrent infection group. Post-treatment analysis revealed that 52% of women consistently exhibited dysbiosis, characterized by microbial imbalance, and 41% of these women frequently experienced recurrent infections during the 12-month follow-up period.

Conclusion: The recurrence of vaginal infections was found to be strongly associated with imbalances in the vaginal microbiota, particularly the dominance of pathogenic organisms over beneficial Lactobacillus species.

Key Words: Vaginal microbiota, recurrent vaginal infections, bacterial vaginosis

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INTRODUCTION

Vaginal infections are commonly encountered health issues among women, with recurrent infections significantly affecting the quality of life. The composition of the vaginal microbiota has been implicated in the development and recurrence of these infections.

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The vaginal microbiome, primarily dominated by Lactobacillus species, plays a crucial role in maintaining vaginal health by producing lactic acid, which helps to lower pH and inhibit the growth of pathogenic microorganisms.[1] However, disruptions in this microbial balance, referred to as dysbiosis, have been linked to recurrent vaginal infections, including bacterial vaginosis (BV) and vulvovaginal candidiasis (VVC) .[2]

Recurrent vaginal infections are often associated with the overgrowth of pathogenic organisms such as Gardnerella vaginalis and Candida albicans, which displace the beneficial Lactobacillus species.[3] It has been shown that women with recurrent infections tend to have a lower prevalence of Lactobacillus and a higher presence of these pathogens[4,5]In addition to microbial imbalances, various factors such as antibiotic overuse, hormonal contraceptive use, and vaginal douching have been identified as significantly contributing to recurrent vaginal infections by disrupting the vaginal microbiota.[6,7]

The role of hormonal contraceptives in altering the vaginal microbiome has been explored, with some studies suggesting that they may predispose women to recurrent infections.[8] Similarly, the overuse of antibiotics can lead to an imbalance in the vaginal flora, promoting the growth of opportunistic pathogens.[9] Lifestyle factors such as vaginal douching and sexual behavior have also been implicated in influencing the vaginal microbiota and its relationship with infection recurrence.[10]

This study was conducted to investigate the relationship between vaginal microbiota composition and the recurrence of vaginal infections in women, focusing on the presence of Lactobacillus, Gardnerella vaginalis, and Candida albicans, as well as potential contributing factors such as antibiotic use, hormonal contraceptives, and hygiene practices.

METHODS

A cohort study was methodically conducted over 12 months to investigate the microbiological profile and contributing factors for recurrent vaginal infections among 400 women aged 18–45 years. Participants were carefully recruited from gynecology clinics, with the requirement that at least three episodes of vaginal infections must have been previously experienced in the past year. Women who were pregnant, breastfeeding, or had recently been treated with antibiotics or antifungal medications were excluded.

Vaginal swab samples were systematically collected at three distinct time points: during symptomatic infections, approximately two weeks post-treatment, and upon recurrence of symptoms. The swabs were sterilely obtained, properly stored in transport media, and thoroughly analyzed in the laboratory. Microbiological evaluations were diligently performed using bacterial and fungal cultures on standard agar media, Gram staining, and advanced identification techniques such as PCR and MALDI-TOF MS.

In addition to microbiological data, detailed information about participants' demographics, medical history, hygiene practices, and sexual behavior was comprehensively captured through a structured questionnaire to identify potential risk factors for recurrence. Follow-ups were regularly conducted quarterly through clinic visits or telephonic interviews to document new infections and assess changes in behavior or treatment response.

The primary outcome was precisely identified as the dominant microorganisms at different stages of infection and recurrence. Secondary outcomes were closely focused on the correlation of demographic and behavioral factors with recurrence rates and the assessment of treatment efficacy by comparing pre- and post-treatment microbial profiles. Ethical approval was successfully obtained, and confidentiality of participants was strictly maintained throughout the study.

RESULTS

Significant differences were clearly observed in the vaginal microbiota of women with recurrent infections compared to those without recurrence. A significantly lower prevalence of Lactobacillus species ($p < 0.001$) was notably observed in women with recurrent infections, while Gardnerella vaginalis (69% vs. 33%, $p = 0.004$) and Candida albicans (56% vs. 25%, $p = 0.002$) were consistently found to be more prevalent in the recurrent infection group. Post-treatment analysis thoroughly showed that dysbiosis, characterized by microbial imbalance, was exhibited by 52% of women, and recurrent infections during the 12-month follow-up period were frequently experienced by 41% of these women. An odds ratio of 3.6 (95% CI: 2.2–5.5, $p < 0.001$) was strongly identified for recurrent infections in women with post-treatment dysbiosis, indicating a strong association between dysbiosis and recurrence. Several risk factors significantly associated with microbial imbalance and recurrence were carefully identified through statistical analysis. The likelihood of dysbiosis was found to be greatly increased by frequent antibiotic use (OR: 3.1, 95% CI: 1.9–5.3, $p < 0.001$). Hormonal contraceptive use, particularly those containing higher estrogen levels, was significantly associated with Candida overgrowth (OR: 2.7, 95% CI: 1.6–4.5, $p = 0.002$). Vaginal douching was clearly identified as a major contributor to microbial imbalance and recurrence, with an odds ratio of 4.6 (95% CI: 2.9–7.3, $p < 0.001$).These findings emphatically highlight the need for modifiable risk factors to be addressed, and personalized treatment strategies to restore a healthy vaginal microbiota and prevent recurrent infections are urgently emphasized.

Table No. 1: Prevalence of Vaginal Microbiota in Women with and without Recurrent Infections

Microbial Species	Recurrent Infection Group (%)	No Recurrence Group (%)	p-value
Lactobacillus species	Significantly lower	Higher	$p < 0.001$
Gardnerella vaginalis	69%	33%	$p = 0.004$
Candida albicans	56%	25%	$p = 0.002$

Table No. 2: Post-Treatment Dysbiosis and Recurrence

Post-Treatment Dysbiosis Status	Percentage of Women with Dysbiosis (%)	Percentage of Women with Recurrence (%)	Odds Ratio (OR)
Dysbiosis	52%	41%	OR = 3.6 (95% CI: 2.2–5.5)
No Dysbiosis	48%	15%	

Table No. 3: Risk Factors for Dysbiosis and Recurrence of Infection

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Frequent Antibiotic Use	3.1	1.9–5.3	$p < 0.001$
Hormonal Contraceptives (Higher Estrogen)	2.7	1.6–4.5	$p = 0.002$
Vaginal Douching	4.6	2.9–7.3	$p < 0.00$

Table 4: Summary of Statistical Analysis

Measure	Recurrent Infection Group (%)	Non-Recurrence Group (%)	p-value
Prevalence of Lactobacillus	Significantly lower	Higher	$p < 0.001$
Prevalence of Gardnerella vaginalis	69%	33%	$p = 0.004$
Prevalence of Candida albicans	56%	25%	$p = 0.002$
Post-Treatment Dysbiosis	52%		
Recurrent Infections Post-Treatment	41%		

DISCUSSION

It was found that recurrent vaginal infections are strongly associated with a dysbiotic vaginal microbiota, characteristically marked by a decrease in Lactobacillus species and an increase in Gardnerella vaginalis and Candida albicans.[11] Consistency with previous research was clearly observed, where it has been repeatedly demonstrated that Lactobacillus dominance is crucial for maintaining vaginal health, while disruptions in this balance are often frequently followed by recurrent infections.[12] The hypothesis that these organisms play a central role in infection recurrence was strongly supported by the higher prevalence of Gardnerella vaginalis and Candida albicans observed in women with recurrent infections.[13]

It was also observed that 51% of women consistently exhibited dysbiosis post-treatment, and recurrence of infections was commonly experienced by 40%, suggesting that current treatment regimens may not effectively restore the vaginal microbiota to a healthy state. This clearly highlights the need for more targeted therapies.[14,15] The association of antibiotic overuse, hormonal contraceptive use, and vaginal douching with microbial imbalance and recurrent infections was found to be significantly consistent with the literature.[16,17] Disruption of the vaginal microbiota through antibiotic use is frequently known to occur by eradicating beneficial bacteria and indiscriminately promoting the growth of pathogens such as Candida. Alteration of the hormonal milieu by hormonal contraceptives may also negatively affect the vaginal environment, readily predisposing women to infections. The link between vaginal douching and recurrent infections has been well documented, as the natural balance of the vaginal microbiota is significantly disturbed by douching, greatly increasing susceptibility to infection. Contribution to the introduction of pathogens into the vaginal environment by sexual behavior, particularly unprotected intercourse, has also been frequently observed, further adversely complicating the microbiota and notably increasing the risk of recurrent infections.

A contribution to the growing body of evidence suggesting that disruptions in the vaginal microbiota play a crucial role in the recurrence of vaginal infections was effectively made by this study. While the risk of dysbiosis may be substantially increased by antibiotics and hormonal contraceptives, the importance of addressing lifestyle factors such as douching and sexual practices in the prevention and management of recurrent vaginal infections was also clearly highlighted. Further research is urgently required to explore the long-term effects of microbial imbalances and to develop more efficiently personalized treatments for recurrent vaginal infections.

CONCLUSION

In conclusion, the recurrence of vaginal infections has been strongly associated with imbalances in the vaginal microbiota, particularly the dominance of pathogenic organisms over beneficial Lactobacillus species. Significant contributors to microbial dysbiosis and recurrent infections are antibiotic overuse, hormonal contraceptive use, and vaginal douching. It is urgently suggested that addressing these factors in clinical practice may help substantially reduce the incidence of recurrent vaginal infections and positively improve women's health outcomes.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Sara Akram, Aurooj Fatima, Hina Zubair,
Drafting or Revising Critically:	Nasreen Akhter, Mubashra Ghulam Muhammad
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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