

Original Article

Comparison of Effectiveness of Probiotic versus Antibiotic Monotherapy in the Treatment of Bacterial Vaginosis: A Quasi-experimental Study

Sumera Kanwal,¹ Quratulain Shahzad,² Zobia Jawad,¹ Nomia Ashraf,³ Musarrat Fatima,⁴ Aisha Malik³

¹King Edward Medical University/ Lady Willingdon Hospital, Lahore, ²Akhtar Saeed Medical College, Lahore,

³Fatima Jinnah Medical University, Lahore, ⁴Government Judicial Complex, Hafizabad

Abstract

Objective: To compare the treatment success rate among women with bacterial vaginosis receiving either probiotic or antibiotic monotherapy.

Methods: A quasi-experimental study was conducted in the Department of Obstetrics & Gynaecology at Lady Willingdon Hospital, Lahore, from August 2022 to March 2023. Total 168 women were allocated into two non-randomized groups of equal size. Group A (n = 84) received probiotics twice daily for six weeks, while Group B (n = 84) received antibiotics twice daily for seven days. At six weeks post-intervention, women meeting at least three of the four Amsel's criteria were diagnosed as bacterial vaginosis positive; those who did not were considered treated successfully. Chi-square test used to compare the treatment success rate between groups.

Results: The distribution of baseline characteristics was comparable between study groups (all p-values >0.05). Six weeks after intervention, women in Probiotic group had slight higher frequency of vaginal discharge (60.7% vs. 57.1%; p-value 0.638), and significantly lower frequencies of fishy odor vaginal fluid (33.3% vs. 51.2%; p-value 0.019), vaginal pH >4.5 (22.6% vs. 53.6%; p-value <0.001), and presence of clue cells (20.2% vs. 36.9%; p-value 0.017). Overall 63.7% women were successfully treated. The women in Probiotic group showed significantly higher treatment success rate as compared to the Antibiotic group (71.4% vs. 56.0%; p-value 0.037).

Conclusion: Probiotics were more effective than antibiotics in treating bacterial vaginosis, with higher success rates and better symptom resolution. These findings support probiotics as a viable standalone treatment option.

Keywords: Probiotics, Antibiotics, Effectiveness, Bacterial, Vaginosis.

How to cite this:

Kanwal S, Shahzad Q, Jawad Z, Ashraf N, Fatima M, Malik A. Comparison of Effectiveness of Probiotic versus Antibiotic Monotherapy in the Treatment of Bacterial Vaginosis: A Quasi-experimental Study. *J Pak Soc Intern Med.* 2026;7(2): 104-108

Corresponding Author: Dr. Sumera Kanwal, **Email:** sumera_kanwal11@yahoo.com

Received: 18-08-2025 **Revised:** 15-04-2026 **Accepted:** 04-05-2026 **DOI:** <https://doi.org/10.70302/jpsim.v7i2.2621>

Introduction

Bacterial vaginosis is one of the leading causes of foul-smelling vaginal discharge in women of childbearing age and is associated with poor gynecological and perinatal outcomes.¹ The vaginal mucosa harbors various aerobic and anaerobic bacteria that remain in equilibrium.² Lactobacilli are predominant in premenopausal women, maintaining an acidic pH. This acidic pH of the vaginal mucosa prevents the colonization of other harmful microbes.³ When certain bacteria including *Gardnerella vaginalis*, *Mobiluncus*, *Peptostreptococcus*, *Mycoplasma hominis*, and *Ureaplasma urealyticum* increase in number, they replace the previously dominant lactobacilli and

cause the rise in vaginal pH.⁴ Majority of vaginal discharge cases are caused by *Gardnerella vaginalis*, which is responsible for bacterial vaginosis.⁵ Women with bacterial vaginosis are more susceptible to other infections that compromise the reproductive system and contribute to poor pregnancy outcomes. Bacterial vaginosis is also associated with chronic pelvic infections and increased vulnerability to sexually transmitted infection (STIs) including human immunodeficiency virus (HIV). It results in vulval discomfort and is notorious for recurrence, affecting the overall well-being of women.⁶ The commonly stated prevalence rate for bacterial vaginosis is 29%.⁷ The condition is diagnosed based

on symptoms, along with either Amsel criteria or the Nugent score. Amsel criteria are simpler, more convenient, and considered the gold standard.⁸

Traditionally, antibiotics such as metronidazole, tinidazole, and clindamycin have been used to treat bacterial vaginosis. However, all are associated with high recurrence rates, even after initially successful therapy. This is due to the protection afforded by the biofilm formed by many bacterial species involved. As a result, treatment with antibiotics alone is becoming less attractive, especially given the risk of increasing antibiotic resistance.⁹ Recently, newer treatment options using probiotics have gained popularity due to their added benefit of decreased recurrence rates. Probiotics are live microorganisms that, when introduced in appropriate amounts, provide beneficial effects to the host.¹⁰ Their effect can be enhanced when used alongside antibiotics. A study by Menard JP revealed that administering metronidazole 500 mg twice a day for 7 days, along with oral probiotics twice a day for 30 days, significantly increased the efficacy of metronidazole compared to metronidazole alone.¹¹

This evidence strongly supports the use of probiotics in the management of bacterial vaginosis. Although evidence supports the use of probiotics as part of combination therapy with antibiotics for bacterial vaginosis, though research on their effectiveness as a standalone treatment remains limited. Therefore, the present study evaluated and compared the treatment success rate among women with bacterial vaginosis receiving either probiotic or antibiotic monotherapy. This approach may help avoid the unwanted side effects of antibiotics and reduce the risk of resistance, while also providing prolonged protection against recurrence.

Methods

A quasi-experimental study was conducted in the Department of Obstetrics & Gynaecology at Lady Willingdon Hospital, Lahore, from August 2022 to March 2023. The study adhered to the Declaration of Helsinki and was approved by the hospital's Ethics Committee (15567/REG/KEMU/2021 dated 8th November 2021). Informed consent was obtained from all volunteer participants, ensuring autonomy, confidentiality, and the right to withdraw at any time.

Women aged 18–45 years, diagnosed with bacterial vaginosis according to Amsel's criteria (meeting at least three of the following: greyish-white vaginal discharge, positive amine test, vaginal pH >4.5, and presence of clue cells >20% on wet mount), were included through consecutive sampling. Exclusion criteria included women who were unmarried, pregnant, lactating, menopausal, immunocompromised, diabetic, had a history of allergy, malignancy of the reproductive tract, or had recently received treatment for bacterial vaginosis.

The sample size was estimated based on an expected treatment success rate of 61.5% for probiotics and 36.6% for antibiotics in women with bacterial vaginosis, using a 95% confidence level and 90% power of the test. Total 168 women who met the selection criteria enrolled from the hospital's outpatient department and allocated into two non-randomized groups of equal size. In A group, women (n=84) received one probiotic capsule (*Lactocaseibacillus rhamnosus* GR-1 and *Limosilactobacillus reuteri* RC-14) twice a day for 6 weeks. In B group, women (n=84) received antibiotic treatment (tab clindamycin 300 mg) twice a day for 7 days.

Before intervention, patient's medical background, physical health and demographic characteristics were noted on a predesigned proforma. All women were followed at the hospital's outpatient department. At six weeks after intervention, women were re-examined for bacterial vaginosis using the Amsel's criteria. Women meeting at least three of the four Amsel's criteria were diagnosed as bacterial vaginosis positive; while those who did not were considered treated successfully.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26. Quantitative variables including age and pH reported as mean and standard deviation. Qualitative variables including microscopy, scent, and therapeutic efficacy reported as frequency and percentage. Age and pH levels were used to stratify the data. Chi-square test used to compare the treatment success rate between probiotic and antibiotic groups. p -value ≤ 0.05 was considered statistically significant.

Results

Overall age of all participants ranged between 22 and 45 in both groups. The mean age of participants in Probiotic group (33.9 ± 2.6 years) was comparable Antibiotic group (34.5 ± 3.5 years). Parity distribution in Probiotic group (1-2, 67.86% and 3-4 32.14%) were also similar to Antibiotic group (1-2, 69.04% and 3-4 30.95%). In Probiotic group, 41.67% participants were normal weight (BMI ≤ 24.9 Kg/m²), 35.71% were overweight (BMI 25.0-29.9 Kg/m²) and 22.62% were obese (BMI ≥ 30.0 Kg/m²). Whereas, in Antibiotic group, 48.81% participants were normal weight (BMI ≤ 24.9 Kg/m²), 34.52% were overweight (BMI 25.0-29.9 Kg/m²) and 16.67% were obese (BMI ≥ 30.0 Kg/m²). Mean duration of marriage was 9.4 ± 1.7 years in Probiotic group and 7.4 ± 1.1 years in Antibiotic group. Mean duration of vaginal discharge was 8.6 ± 2.1 and 7.4 ± 1.7 days for Probiotic group and Antibiotic group respectively. Overall, the distribution of baseline characteristics was comparable between study groups (all p -values >0.05).

Six weeks after intervention, women in Probiotic group had slight higher frequency of vaginal discharge (60.7% vs. 57.1%; p -value 0.638), and significantly lower fre-

Table 1: Components of Amsel's criteria six weeks after treatment

		Total (n=168)	Probiotic (n=84)	Antibiotic (n=84)	p-value
Thin, homogeneous vaginal discharge	Yes	99(58.9%)	51(60.7%)	48(57.1%)	0.638
	No	69(41.1%)	33(39.3%)	36(42.9%)	
'Fishy' odor of vaginal fluid	Yes	71(42.3%)	28(33.3%)	43(51.2%)	0.019
	No	97(57.7%)	56(66.7%)	41(48.8%)	
Vaginal pH >4.5	Yes	64(38.1%)	19(22.6%)	45(53.6%)	<0.001
	No	104(61.9%)	65(77.4%)	39(46.4%)	
Presence of clue cells	Yes	48(28.6%)	17(20.2%)	31(36.9%)	0.017
	No	120(71.4%)	67(79.8%)	53(63.1%)	

Table 2: Bacterial vaginosis based on Amsel's criteria six weeks after treatment

		Total (n=168)	Probiotic (n=84)	Antibiotic (n=84)	p-value
Bacterial vaginosis	Treatment success	107(63.7%)	60(71.4%)	47(56.0%)	0.037
	Treatment failure	61(36.3%)	24(28.6%)	37(44.0%)	

quencies of fishy odor vaginal fluid (33.3% vs. 51.2%; p-value 0.019), vaginal pH >4.5 (22.6% vs. 53.6%; p-value <0.001), and presence of clue cells (20.2% vs. 36.9%; p-value 0.017) as shown in Table 1.

Six weeks after intervention, overall 63.7% women were successfully treated. The women in Probiotic group showed significantly higher treatment success rate as compared to the Antibiotic group (71.4% vs. 56.0%; p-value 0.037) as shown in Table 2.

Discussion

Treatment options for bacterial vaginosis are diverse, with antibiotics traditionally used as the standard therapy. Recently, probiotics have emerged as a promising alternative approach. Probiotics are those microbes, which provide health benefits to the host when administered in appropriate quantity. Although many randomized trial and systematic reviews have shown beneficial effects of adding probiotics with standard antibiotic therapy for treating bacterial vaginosis still there is not sufficient data to recommend probiotics solely for management of certain diseases at present.¹² In this study, we compared the effectiveness of probiotics alone with antibiotic therapy for treating bacterial vaginosis. The results showed that the efficacy of probiotic treatment (71.4%) was significantly higher as compared to antibiotic treatment (56.0%). These findings align with a randomized controlled trial in which probiotics in combination with antibiotics therapy showed higher efficacy as compared to antibiotic treatment alone for treatment of bacterial vaginosis i.e. 83.33% vs. 36.67%, p-value <0.001.¹³ In another randomized controlled trial, efficacy of antibiotic therapy with and without probiotics was assessed for treating bacterial vaginosis. Efficacy of

combination therapy was significantly greater as compared to antibiotic therapy alone i.e. 88% vs. 40%.¹¹ However, two meta-analyses concluded that probiotics may be effective as a standalone treatment or as an adjunct to conventional therapy for bacterial vaginosis, although the supporting evidence remains limited and of low quality.^{14,15} Another meta-analysis reported that probiotics alone were more effective in treating bacterial vaginosis in both the short and long term, contrasting with their use as a follow-up to antibiotic therapy.¹⁶

Heczko and coworkers in a double-blind randomized placebo-controlled trial assessed efficacy of probiotics for treating bacterial vaginosis. The results showed that oral probiotics were associated with long-term complete remission in women with recurrent bacterial vaginosis/aerobic vaginitis (BV/AV) and was effective in improving symptoms and lab parameters. Probiotics delayed the clinical relapse of BV/AV symptoms up to 51 % as well as relapse was delayed by up to 76 % when compared with placebo.¹⁷ Although these results are in line with the results of this study supporting a beneficial role of probiotics for treating bacterial vaginosis. However, in this study the relapse was not seen, as only efficacy was the focus of the study.

A recently published systematic review and meta-analysis from China showed that long term probiotic administration (1-3 months) proved to be more beneficial than short term (less than 1 month) in treatment of women with bacterial vaginosis.¹⁸ Nurainiwati and colleagues in a meta-analysis signified superior effect of probiotics in terms of cure rate, recurrence and failure of treatment. There was no significant difference in the occurrence of adverse events.¹⁹ A recently published meta-analysis by Shan et al. reported that, so far, limited evidence supports the use of probiotics either alone or in combi-

nation with antibiotics for short-term treatment of bacterial vaginosis; however, evidence regarding long-term treatment remains inconclusive.²⁰ Several randomized controlled trials have been conducted on this topic, but their results demonstrated inconsistent efficacy. Notably, these studies did not employ a standardized probiotic dosage.^{21,22} However, there is evidence suggesting that the administration of probiotics for the treatment of bacterial vaginosis may offer benefits that outweigh potential side effects.²³

Antibiotics often remove both harmful and helpful bacteria, which can disturb the natural balance in the reproductive tract. Using probiotics at the same time or on their own helps support beneficial bacteria like lactobacilli. These good bacteria protect against harmful microbes and reduce the chance of infection coming back, both in the short and long term. Women will also be less vulnerable to vaginitis with use of probiotics as they increase commensals, which in turn stimulate the immune system via competitive adhesion for effectively treating bacterial vaginosis.^{24,25}

Conclusion: Probiotics showed superior effectiveness over antibiotics in treating bacterial vaginosis, suggesting their potential as a safe standalone therapy. Clinicians may consider probiotics for uncomplicated cases, while further research should define optimal strains and treatment protocols.

Ethical Approval: The IRB/EC approved this study via letter no. 15567/REG/KEMU/2021 dated November 8, 2021.

Conflict of Interest: None

Funding Source: None

Authors' Contribution

SK: Conception.

QS, NA, MF: Design of the work.

ZJ, AM: Data acquisition, analysis, or interpretation.

SK, QS, NA, MF: Draft the work.

ZJ, AM: Review critically for important intellectual content.

All authors approve the version to be published.

All authors agree to be accountable for all aspects of the work.

References

1. Kaambo E, Africa C, Chambuso R, Passmore JS. Vaginal microbiomes associated with aerobic vaginitis and bacterial vaginosis. *Front Public Health*. 2018;6:78. doi: 10.3389/fpubh.2018.00078.
2. Mogha KV, Prajapati JB. Selection of promising strain of *Lactobacillus* for treating vaginal infections. *Rev Res Med Microbiol*. 2017;28(2):49-55.
3. Valenti P, Rosa L, Capobianco D, Lepanto MS, Schiavi E, Cutone A, et al. Role of lactobacilli and lactoferrin in the mucosal cervicovaginal defense. *Front Immunol*. 2018;9:376. doi: 10.3389/fimmu.2018.00376.
4. Onderdonk AB, Delaney ML, Fichorova RN. The human microbiome during bacterial vaginosis. *Clin Microbiol Rev*. 2016;29(2):223-38.
5. Muzny CA, Taylor CM, Swords WE, Tamhane A, Chattopadhyay D, Cerca N, et al. An updated conceptual model on the pathogenesis of bacterial vaginosis. *J Infect Dis*. 2019;220(9):1399-405.
6. Nasioudis D, Linhares IM, Ledger WJ, Witkin SS. Bacterial vaginosis: a critical analysis of current knowledge. *BJOG*. 2017;124(1):61-9.
7. Zozaya M, Ferris MJ, Siren JD, Lillis R, Myers L, Nsuami MJ, et al. Bacterial communities in penile skin, male urethra, and vaginas of heterosexual couples with and without bacterial vaginosis. *Microbiome*. 2016;4(1):16.
8. Muthusamy S, Varghese J, Raveendran V, Ezilarasan K, Easow JM. Evaluation of interobserver reliability of Nugent score for diagnosis of bacterial vaginosis. *Indian J Sex Transm Dis AIDS*. 2018;39(2):120-3.
9. Verstraelen H, Swidsinski A. The biofilm in bacterial vaginosis: implications for epidemiology, diagnosis and treatment: 2018 update. *Curr Opin Infect Dis*. 2019;32(1):38-42.
10. Menard JP. Antibacterial treatment of bacterial vaginosis: current and emerging therapies. *Int J Womens Health*. 2011;3:295-305. doi: 10.2147/IJWH.S23814.
11. Nayana AR, Keerthi TR. Harnessing probiotics and prebiotics for the prophylaxis and treatment of bacterial vaginosis. *Biosci Biotech Res Asia*. 2024;21(4): 1289-1301.
12. Abbe C, Mitchell CM. Bacterial vaginosis: a review of approaches to treatment and prevention. *Front Reprod Health*. 2023;5:1100029.
13. Arooj A, Bano N, Nazir R, Chaudhri R. Comparison of combined probiotic and antibiotic therapy versus antibiotic therapy alone in treatment of bacterial vaginosis. *J Soc Obstet Gynaecol Pak*. 2017;7(2):57-60.
14. Hanson L, VandeVusse L, Jermé M, Abad CL, Safdar N. Probiotics for treatment and prevention of urogenital infections in women: a systematic review. *J Midwifery Womens Health*. 2016;61(3):339-55.
15. Huang H, Song L, Zhao W. Effects of probiotics for the treatment of bacterial vaginosis in adult women: a meta-analysis of randomized clinical trials. *Arch Gynecol Obstet*. 2014;289(6):1225-34.
16. Wang Z, He Y, Zheng Y. Probiotics for the treatment of bacterial vaginosis: a meta-analysis. *Int J Environ Res Public Health*. 2019;16(20):3859.
17. Heczko PB, Tomusiak A, Adamski P, Jakimiuk AJ, Stefański G, Mikołajczyk-Cichońska A, et al. Supplementation of standard antibiotic therapy with oral probiotics for bacterial vaginosis and aerobic vaginitis: a randomised, double-blind, placebo-controlled trial. *BMC Womens Health*. 2015;15:115. doi: 10.1186/s12905-015-0246-6.

18. Liu HF, Yi N. A systematic review and meta-analysis on the efficacy of probiotics for bacterial vaginosis. *Eur Rev Med Pharmacol Sci.* 2022;26(1):90-8.
19. Nurainiwati SA, Ma'roef M, Pravitasari DN, Putra PYP. Effectivity and efficacy probiotics for bacterial vaginosis treatments: meta-analysis. *Infect Dis Model.* 2022;7(4):597-604.
20. Shan Y, Cui Z, Ding Z, Yao Y, Chen A. Efficacy of probiotics in the treatment of adult female bacterial vaginosis: a meta-analysis. *Clin Exp Obstet Gynecol.* 2023; 50(3):50.
21. Armstrong E, Hemmerling A, Miller S, Burke K, Newmann S, Morris S, et al. Impact of LACTIN-V (*Lactobacillus crispatus* CTV-05) on genital immunology following standard bacterial vaginosis treatment: Results from a randomized placebo-controlled trial. *J Int AIDS Soc.* 2021;24(S1):46-7.
22. Zhang Y, Lyu J, Ge L, Huang L, Peng Z, Liang Y, et al. Probiotic *Lactobacillus rhamnosus* GR-1 and *Limosilactobacillus reuteri* RC-14 as an adjunctive treatment for bacterial vaginosis do not increase the cure rate in a Chinese cohort: a prospective, parallel-group, randomized, controlled study. *Front Cell Infect Microbiol.* 2021;11:669901. doi: 10.3389/fcimb.2021.669901.
23. Li C, Wang T, Li Y, Zhang T, Wang Q, He J, et al. Probiotics for the treatment of women with bacterial vaginosis: A systematic review and meta-analysis of randomized clinical trials. *Eur J Pharmacol.* 2019; 864: 172 660. doi: 10.1016/j.ejphar.2019.172660.
24. Vicariotto F, Mogna L, Del Piano M. Effectiveness of the two microorganisms *Lactobacillus fermentum* LF15 and *Lactobacillus plantarum* LP01, formulated in slow-release vaginal tablets, in women affected by bacterial vaginosis: a pilot study. *J Clin Gastroenterol.* 2014;48 (Suppl 1):S106-12.
25. Ling Z, Liu X, Chen W, Luo Y, Yuan L, Xia Y, et al. The restoration of the vaginal microbiota after treatment for bacterial vaginosis with metronidazole or probiotics. *Microb Ecol.* 2013;65(3):773-80.