



## Research Article

Copyright © All rights are reserved by Lana Lekić

# Clinical Application of *Lactobacillus rhamnosus* In Treating Vaginal Infections: Symptom Control and Infection Clearance

Lana Lekić\*

<sup>1</sup>Faculty of Health Studies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina**Corresponding author:** Lana Lekić, Faculty of Health Studies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina**Received Date:** November 23, 2024**Published Date:** December 03, 2024

## Abstract

*Lactobacillus rhamnosus* is a well-known probiotic with proven beneficial effects on maintaining and restoring the balance of the vaginal microbiota. It plays a significant role in reducing infections and improving symptoms associated with vaginal disorders. In our study, we evaluated the effects of *Lactobacillus rhamnosus* ( $10^8$  CFU/ml) on the presence of *Candida albicans* and *Gardnerella vaginalis*, as well as on common symptoms such as itching, burning, increased discharge, and dryness in a cohort of 30 women across different age groups. The results demonstrated a marked improvement in all age groups, except for women aged 40-45 years, who exhibited more persistent symptoms despite probiotic intervention. Prior to treatment, the 40-45 age group showed the highest rates of infection and symptom severity. However, after 30 days of *Lactobacillus rhamnosus* application, a significant reduction in both infection levels and symptoms was observed in younger groups (20-35 years). In these groups, symptoms such as itching, burning, and dryness were notably alleviated, and the infections caused by *Candida albicans* and *Gardnerella vaginalis* were significantly reduced. The age group of 40-45 years, however, still showed some residual symptoms, which could be attributed to hormonal changes associated with perimenopause and menopause, as well as a generally weaker immune response and basal metabolism in older women. These factors may contribute to a slower or less complete response to probiotic therapy in this population. In conclusion, our results reinforce the beneficial effects of *Lactobacillus rhamnosus* in managing vaginal infections and associated symptoms, particularly in younger women. The findings also highlight the challenges posed by hormonal changes in older women, suggesting that additional therapeutic interventions, such as hormone replacement therapy or more tailored probiotic treatments, may be necessary to achieve optimal results in this age group. Further studies are needed to explore the underlying mechanisms of these age-related differences and to develop personalized treatments for women of various age groups.

**Keyword:** *Lactobacillus rhamnosus*; *Candida albicans*; *Gardnerella vaginalis*; vaginal infection; symptoms**Field:** Pharmacoeconomics, Pharmacy

## Introduction

*Lactobacillus rhamnosus* GG (LGG), known under the reference number ATCC 53103, was first isolated by Sherwood Gorbach and Barry Goldwin from the stool samples of a healthy adult

individual, with its designation "GG" derived from the initials of the researchers [1]. Upon discovery, LGG was immediately recognized as a potential probiotic strain due to its resistance to acid and

bile, as well as its favorable growth characteristics. Numerous studies have confirmed that LGG can be detected in the stool of adults for at least seven days after oral administration, while in neonates, it persists longer and at higher concentrations, indicating a better colonization capacity during early life, attributed to the less developed gut microbiota in newborns [2]. LGG exerts its beneficial effects through several key mechanisms, including the inhibition of pathogenic microorganisms either directly or by influencing the gut microbiota, enhancement of epithelial barrier function via regulation of signaling pathways such as NF- $\kappa$ B, Akt, and MAPK, contributing to increased mucus production and improved tight junction integrity, and immunomodulation through the regulation of local and systemic immune responses, mediated by microbe-associated molecular patterns (MAMPs) recognized by receptors such as Toll-like receptors (TLRs) [3]. The combination of resistance to gastrointestinal stressors, adherence capacity to epithelial cells, and immunomodulatory properties makes LGG an exceptionally valuable probiotic strain, with extensively studied effects in clinical research. In the context of vaginal health, *Lactobacillus rhamnosus* plays a pivotal role in maintaining the balance of the vaginal microbiota, where healthy microbiota are dominated by lactobacilli that produce lactic acid, creating an acidic environment (pH 3.8–4.5) hostile to the growth of pathogenic bacteria and fungi [4,5]. This probiotic produces lactic acid, hydrogen peroxide, and bacteriocins—natural substances that inhibit the growth of microorganisms such as *Candida albicans* and *Gardnerella vaginalis*, the main culprits of vaginal infections [6]. Its ability to adhere to the epithelial cells of the vaginal mucosa allows it to compete with pathogens for binding sites, preventing their colonization and biofilm formation [7]. Studies have shown that regular use of products containing *Lactobacillus rhamnosus* can reduce the frequency of recurrent vaginal infections, such as bacterial vaginosis and vaginal candidiasis. Moreover, its immunomodulatory effects further enhance local immune responses by stimulating the secretion of immunoglobulin A (IgA) and regulating pro-inflammatory cytokines, thereby contributing to the protection of the vaginal ecosystem [8]. This probiotic is recommended not only for women suffering from vaginal infections but also for those seeking to maintain urogenital health, especially during periods of increased risk of dysbiosis, such as pregnancy, menopause, antibiotic use, or stress. Its safety and proven efficacy

make it an ideal choice for supporting health and preventing infections.

## Material and methods

The study, conducted to evaluate the effect of oral administration of a probiotic supplement containing *Lactobacillus rhamnosus* on vaginal flora, included 30 women aged 20–45 years and was strictly anonymous. Participants were healthy women without active infections, pregnancy, chronic illnesses, or recent use of antibiotics or antifungal medications within the last 90 days. The participants consumed one probiotic capsule daily (containing at least 108CFU per capsule) for 30 days. Vaginal swabs were collected before and after the intervention by trained medical personnel under sterile conditions and analyzed using standard microbiological techniques, including Gram staining and bacterial species identification. In addition to microbiological analyses, symptoms of vaginal discomfort (itching, burning, increased discharge, dryness) were assessed through a standardized questionnaire administered both before and after the treatment, ensuring that all data were collected and processed with full participant anonymity. Qualitative and quantitative data were statistically analyzed to evaluate the probiotic's effects on changes in vaginal microbiota and symptom alleviation. The study was designed as a prospective investigation with pre- and post-treatment assessments.

## Results

In Table 1. presents the mean values and standard deviations for the presence of the fungus *Candida albicans* and the bacterium *Gardnerella vaginalis* in the study participants (30 women). The participants were grouped by age, ranging from 25 to 45 years. Among the participants aged 25–30 years, *Candida albicans* was the most dominant, with an average concentration of  $(5.2 \times 10^3 \pm 1.0 \times 10^3)$ . However, the values in other age groups did not deviate significantly. This pattern was not observed with *Gardnerella vaginalis*, which exhibited substantially higher concentrations overall. For *Gardnerella vaginalis*, the concentrations ranged from 7.5 do  $8.2 \times 10^3$  characterizing it as a highly colonizing strain. The highest concentration was observed in participants aged 30–35 years  $8.2 \times 10^3 \pm 2.6 \times 10^3$  closely followed by participants aged 40–45 years  $(8.1 \times 10^3 \pm 2.7 \times 10^3)$  the latter group also showing the highest standard deviation.

**Table 1:** Mean values and standard deviations of microbiological samples.

Participants		Candida albicans		Gardnerella vaginalis (Mean $\pm$ SD) CFU/ml
		(Mean $\pm$ SD)	CFU/ml	
aged 20-25 years	4	$4.8 \times 10^3 \pm 1.1 \times 10^3$		$7.5 \times 10^3 \pm 2.3 \times 10^3$
aged 25-30 years	4	$5.2 \times 10^3 \pm 1.0 \times 10^3$		$7.8 \times 10^3 \pm 2.4 \times 10^3$
aged 30-35 years	6	$5.0 \times 10^3 \pm 1.3 \times 10^3$		$8.2 \times 10^3 \pm 2.6 \times 10^3$
aged 35-40 years	4	$5.1 \times 10^3 \pm 1.2 \times 10^3$		$8.0 \times 10^3 \pm 2.5 \times 10^3$
aged 40-45 years	12	$4.9 \times 10^3 \pm 1.1 \times 10^3$		$8.1 \times 10^3 \pm 2.7 \times 10^3$

In Table 2. the results of the microbiological sample after 30 days of *Lactobacillus rhamnosus* ( $10^8$  CFU/ml) administration in

30 participants are presented. The results indicate that the effect was more than satisfactory, with a drastic reduction in infection.

The fungus *Candida albicans* showed a decrease to  $2.1 \times 10^3$  in participants aged 25–30 years, who had the most dominant ratio. Overall, the concentration of *Candida albicans* after *Lactobacillus rhamnosus* ( $10^8$  CFU/ml) administration ranged from 1.0 to  $2.1 \times 10^3$ . A similar trend was observed with the bacterium *Gardnerella vaginalis*, which also showed a reduction in infection. In the group with the highest concentration, participants aged 30–35

years recorded  $1.8 \times 10^3$ . The concentration ratio for *Gardnerella vaginalis* ranged from 1.6 to  $1.4 \times 10^3$ , leading to the conclusion that *Lactobacillus rhamnosus* significantly contributes to women's health and the resolution of infections caused by various bacterial strains, including *Gardnerella vaginalis* and *Candida albicans* in our study.

**Table 2:** Presentation of microbiological samples after 30 days of *Lactobacillus rhamnosus* administration.

Participants		Lactobacillus rhamnosus ( $10^8$ CFU/ml)	Candida albicans (Mean $\pm$ SD) CFU/ml	Gardnerella vaginalis (Mean $\pm$ SD) CFU/ml
aged 20-25 years	4	$1.0 \times 10^8$	$1.0 \times 10^3 \pm 0.8 \times 10^3$	$1.6 \times 10^3 \pm 0.8 \times 10^3$
aged 25-30 years	4	$1.0 \times 10^8$	$2.1 \times 10^3 \pm 0.9 \times 10^3$	$1.4 \times 10^3 \pm 0.8 \times 10^3$
aged 30-35 years	6	$1.0 \times 10^8$	$1.1 \times 10^3 \pm 1.0 \times 10^3$	$1.8 \times 10^3 \pm 1.1 \times 10^3$
aged 35-40 years	4	$1.0 \times 10^8$	$1.1 \times 10^3 \pm 1.0 \times 10^3$	$1.7 \times 10^3 \pm 1.0 \times 10^3$
aged 40-45 years	12	$1.0 \times 10^8$	$1.0 \times 10^3 \pm 0.8 \times 10^3$	$1.6 \times 10^3 \pm 0.9 \times 10^3$

In Table 3, the results of the survey questionnaire administered to 30 participants before and after the application of *Lactobacillus rhamnosus* are presented. The questionnaire included symptoms such as itching, burning, increased discharge, and dryness. Participants aged 25 to 45 reported the presence of all symptoms, with some experiencing them less intensely and others more prominently. Participants aged 40 to 45 had a high prevalence

of each accompanying symptom: itching and burning at 83%, increased discharge at 92% and dryness at 100%. However, after the application of *Lactobacillus rhamnosus*, to 40, increased discharge (25%) and dryness (25%) were present. In the 40 to 45-year age group, in addition to burning and increased discharge (both 8%), dryness was also reported in 25% of cases.

**Table 3:** Presentation of symptoms before and after *Lactobacillus rhamnosus* use.

Treatment with <i>Lactobacillus rhamnosus</i> ( $10^8$ CFU/ml)									
BEFORE					AFTER				
Participants	Itching	Burning	Increased discharge	Dryness	Itching	Burning	Increased discharge	Dryness	
aged 20-25 years	4	2 (50%)	1	3	1	0	0	0	0
			-0.25	-0.75	-0.25				
aged 25-30 years	4	3 (75%)	2	2	1	0	0	1	0
			-0.5	-0.5	-0.25			-0.25	
aged 30-35 years	6	4 (66%)	3	4	1	1 (16%)	0	1	0
			-0.5	-0.66	-0.16			-0.16	
aged 35-40 years	4	4	2	3	3	0	0	1	1
		-1	-0.5	-0.75	-0.75			-0.25	-0.25
aged 40-45 years	12	10	10	11	12	2 (16%)	1	1	3
		(-83)	(-83%)	(-92%)	(-100%)		(-8%)	(-8%)	(-25%)

## Conclusion

Based on the results, it is evident that the participants aged 40 to 45 experienced the most severe infections and symptoms, with high rates of itching, burning, increased discharge, and dryness

before the treatment. This age group demonstrated the most pronounced infection severity and symptom intensity, indicating stronger underlying inflammatory processes. In contrast, all other age groups showed a significant reduction in both infections and symptoms after the application of *Lactobacillus rhamnosus*,

reflecting a positive therapeutic effect. However, a slight persistence of symptoms was observed in the 40 to 45-year-old group, which may be attributed to their generally weaker basal metabolism and immune response, as well as the potential influence of the perimenopausal phase. These factors likely contribute to a slower recovery and a more persistent symptomatology compared to younger age groups.

## Discussion

The results of our study show significant changes in symptoms and infections after the application of *Lactobacillus rhamnosus* in participants from different age groups. Although women aged 40-45 years had pronounced symptomatology and more severe infections before treatment, after 30 days of probiotic application, a significant reduction in symptoms was observed in all groups, except for women in this age group. These women retained certain symptoms, which can be attributed to their specific health condition commonly seen during the perimenopausal period. According to some studies, older women have reduced immune system functionality, which may cause a slower response to infections and prolonged symptom duration. Additionally, changes in hormonal status, such as a decline in estrogen levels during menopause, can affect the vaginal microbiome by reducing the number of beneficial bacteria like *Lactobacillus* spp., increasing susceptibility to infections caused by *Candida albicans* and *Gardnerella vaginalis* [9]. These factors may explain the weaker response to treatment in women during perimenopause and menopause. In our study, women in younger age groups (20-35 years) showed a significant reduction in symptoms such as itching, burning, increased discharge, and dryness, which can be attributed to the effective influence of *Lactobacillus rhamnosus* on the vaginal microbiome balance. Probiotics like *Lactobacillus* have the ability to restore healthy microbiota, lower pH levels, and stimulate immune responses, which leads to a reduction in infections and inflammatory processes in the vagina [10]. It is important to note that although symptoms were significantly reduced in all participants, including those in the older age group, complete recovery was not always achieved, especially in women aged 40-45 years. This may indicate the need for additional therapeutic approaches, such as hormone therapy or more specific probiotics for older women, which could be more effective in reducing symptoms and preventing recurrent infections. In conclusion, our results support the importance of applying probiotics in the treatment of vaginal infections, with an emphasis on the specific challenges in older age groups, where additional factors such as hormonal changes may play a significant role in treatment success. Further research is needed to better

understand the mechanisms behind these differences in response to treatment and to develop personalized approaches for different age groups.

## Acknowledgement

The author thanks to Prof. Darshana Choubisa, Department of Prosthodontics and Crown & Bridge, Geetanjali Dental and Research Institute, Udaipur, Rajasthan 313002, India for help.

## Conflict of Interest

The author has no conflict of interest.

## References

1. Capurso L (2019) Thirty years of *Lactobacillus rhamnosus* GG: a review. *Journal of Clinical Gastroenterology* 53: S1-S41.
2. Petrova MI, Reid G, Ter Haar JA (2021) *Lactobacillus rhamnosus* GR-1, aka *Lactobacillus rhamnosus* GR-1: past and future perspectives. *Trends in Microbiology* 29(8): 747-761.
3. Yang S, Reid G, Challis JR, Gloor GB, Asztalos E, et al. (2020) Effect of oral probiotic *Lactobacillus rhamnosus* GR-1 and *Lactobacillus reuteri* RC-14 on the vaginal microbiota, cytokines and chemokines in pregnant women. *Nutrients* 12(2): 368.
4. Liu Y, Huang Y, Cai W, Li D, Zheng W, et al. (2020) Effect of oral *Lactobacillus rhamnosus* GR-1 and *Lactobacillus reuteri* RC-14 on vaginal Group B *Streptococcus* colonization and vaginal microbiome in late pregnancy. *Journal of Southern Medical University* 40(12): 1753-1759.
5. Spaggiari L, Sala A, Ardizzoni A, De Seta F, Singh DK, et al. (2022) *Lactobacillus acidophilus*, *L. plantarum*, *L. rhamnosus*, and *L. reuteri* cell-free supernatants inhibit *Candida parapsilosis* pathogenic potential upon infection of vaginal epithelial cells monolayer and in a transwell coculture system in vitro. *Microbiology Spectrum* 10(3): e0269621.
6. Chee WJY, Chew SY, Than LTL (2020) Vaginal microbiota and the potential of *Lactobacillus* derivatives in maintaining vaginal health. *Microbial Cell Factories* 19(1): 203.
7. Chung Y, Kang SB, Son D, Lee JY, Chung MJ, et al. (2023) Characterization of the probiotic properties of *Lactobacillus rhamnosus* LR6 isolated from the vaginas of healthy Korean women against vaginal pathogens. *Frontiers in Microbiology* 14: 1308293.
8. Silva JA, De Gregorio PR, Rivero G, Abraham G A, Nader Macías MEF (2021) Immobilization of vaginal *Lactobacillus* in polymeric nanofibers for its incorporation in vaginal probiotic products. *European Journal of Pharmaceutical Sciences* 156: 105563.
9. Albarillo FS, Shah U, Joyce C, Slade D (2020) *Lactobacillus rhamnosus* infection: a single-center 4-year descriptive analysis. *Journal of Global Infectious Diseases* 12(3): 119-123.
10. Fanning L, Woods E, Hornung CJ, Perrett K P, Tang ML, et al. (2021) Cost-effectiveness of food allergy interventions in children: a systematic review of economic evaluations. *Value in Health* 24(9): 1360-1376.