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# The effect of probiotic supplementation on blood pressure, systemic inflammation and endothelial function in patients with arterial hypertension

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***Abstract:*** *The need for new therapeutic approaches to the treatment of arterial hypertension is due to its increasing prevalence and high mortality rate, which prompts the search for new methods of therapy. Recent scientific data indicate the important role of gut microbiome imbalance, which can lead to disruption of the gut barrier and the development of chronic low-intensity systemic inflammation. This inflammation is a key mechanism in the pathogenesis of arterial hypertension and causes endothelial dysfunction, as evidenced by higher levels of pro-inflammatory cytokines. This highlights new therapeutic perspectives for the correction of gut dysbiosis as a therapeutic strategy with the potential to improve disease control. The aim of this prospective study was to evaluate the effect of dietary probiotic supplementation on blood pressure, systemic inflammation and endothelial function in patients with arterial hypertension through correction of gut dysbiosis. The study involved fifty-five patients who were randomized into two groups: the main group (30 people), which, in addition to standard antihypertensive therapy, received a probiotic that included Saccharomyces boulardii and Lactobacillus, and a comparison group (25 people) receiving only standard therapy. The duration of observation was 3 months. All participants underwent a comprehensive clinical examination with analysis of systolic and diastolic blood pressure, levels of interleukin-6 and interleukin-10, assessment of endothelium-dependent vasodilation of the brachial artery, as well as analysis of the composition of the gut microbiome. The study found that before the intervention, the groups were comparable in terms of basic clinical and demographic indicators, with the exception of a significant difference in the proportion of patients with reduced Roseburia content inulinivorans and Faecalibacterium prausnitzii, which limited the direct comparison of the dynamics of these taxa. After 3 months of observation, patients in the main group achieved a significant decrease in systolic and diastolic blood pressure, as well as the level of pro-inflammatory cytokine interleukin-6, while in the comparison group the levels of inflammatory markers did not change significantly. Microbiome analysis showed that the probiotic supplementation effectively corrected gut dysbiosis, as evidenced by a significant decrease in the ratio of Firmicutes to Bacteroidetes, a decrease in the proportion of Firmicutes, and an increase in the proportion of Bacteroidetes and Lactobacillus. At the same time, comparative analysis did not reveal a statistically significant difference in endothelial function indicators between the groups. The results obtained confirm that dietary probiotic supplementation is an effective adjunct method for correcting gut dysbiosis, which helps improve blood pressure control and reduce systemic inflammation in patients with arterial hypertension, which is important for improving the prognosis of the disease.*

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**Keywords:** Blood Pressure, Endothelial Function, Gut Microbiome, Systemic Inflammation, Probiotics.

## Introduction

Arterial hypertension (AH) is defined as a persistent elevation of office systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg, with diagnosis confirmed by repeated measurements, except in cases of grade 3 hypertension (SBP ≥ 180 mmHg and/or DBP ≥ 110 mmHg), where diagnosis may be established at the first visit. Essential arterial hypertension (AH) is a major global health problem and represents the leading risk factor for cardiovascular diseases, carrying a substantial economic burden. Epidemiological data indicate that AH is associated with high prevalence, significant disability, elevated mortality, and low awareness, particularly in low- and middle-income countries. According to the World Health Organization, approximately 1.28 billion adults worldwide aged 30–79 years have hypertension, two-thirds of whom live in low- and middle-income countries, and about 46% are unaware of their condition. In the United States, high blood pressure was a primary or contributing cause in over 660,000 deaths in 2023, with nearly one-fifth of COVID-19–related deaths occurring in individuals with a history of hypertension. Only 22.5% of adults with hypertension achieve adequate blood pressure control. In Ukraine, 34.8% of adults aged 18–69 years had elevated blood pressure in 2019, with a significant proportion unaware of their diagnosis or not receiving treatment [1-4].

The urgency of developing new therapeutic approaches for AH is driven by its growing prevalence and high mortality, prompting the search for innovative treatment strategies. Disturbances in the gut microbiome (GM) can contribute to systemic inflammation - a key mechanism in the development of AH - and promote endothelial dysfunction [1–3]. This is supported by evidence of elevated pro-inflammatory cytokines in patients with microbiome imbalance [4–5].

Gut dysbiosis triggers molecular pathways leading to increased gut permeability, allowing microbialcomponentssuchaslipopolysaccharides (LPS) to enter the bloodstream and activate chronic inflammation, which may contribute to blood pressure elevation [1-2]. Systemic inflammation further plays a central role in endothelial dysfunction, impairing vascular tone regulation and promoting cardiovascular disorders, including hypertension [2-5].

Recent studies emphasize that the gut microbiota modulates metabolic pathways directly involved in blood pressure regulation. Thus, dysbiosis may represent a critical factor disrupting homeostasis through both microbial and systemic mechanisms, correlating with microbiome alterations in patients with AH [6-8]. These findings highlight new prospects for targeting gut dysbiosis as a therapeutic approach [9-15].

## Aim

To assess the impact of dietary probiotic supplementation on blood pressure, systemic inflammation, and endothelial function in patients with arterial hypertension through correction of gut dysbiosis.

## Materials and methods

The study was conducted on the basis of the therapeutic department of the Clinical Hospital No. 18 of Kyiv, which is the clinical base of the Department of Internal Medicine No. 1 of the O.O. Bogomolets National Medical University. This work was a prospective study. A clinical examination was conducted, data analysis of previous medical documentation of patients with arterial hypertension and their selection according to the inclusion and exclusion criteria was carried out.

The study involved and examined 100 people aged 40–75 years who provided informed consent to participate. 55 patients with arterial hypertension (the main group) were under observation, who underwent outpatient and/or inpatient treatment and further observation during 2022–2025. The patients included in the study were divided into two randomized groups: the main (group 1, n=30) and the comparison group

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(group 2, n=25). Randomization provided for the distribution of patients taking into account age, gender, severity and duration of hypertension, as well as the presence of comorbidities.

Inclusion criteria were: men and women aged 40–75 years with stage II, grade 1 or 2 essential arterial hypertension, patients not previously treated with antihypertensive therapy, and for women of reproductive age—a negative pregnancy test and signed informed consent.

Exclusion criteria included: stage III essential hypertension, chronic kidney disease stages III–V (eGFR <60 mL/min/1.73 m²), endocrine disorders, office systolic BP <115 mmHg or diastolic BP <55 mmHg, atrial fibrillation or flutter, second- to third-degree AV block on ECG, NYHA class III–IV chronic heart failure, active inflammatory processes (CRP >10 mg/L), history of acute or chronic coronary syndrome, alcoholism, drug addiction, mental disorders, infectious diseases, oncological or hematological diseases, active gastrointestinal or liver diseases, inflammatory bowel diseases (Crohn's disease, ulcerative colitis), IBS, renal artery stenosis, sarcoidosis, urolithiasis, tuberculosis, pregnancy, and lactation.

The study was performed in compliance with bioethical standards in accordance with the Declaration of Helsinki (Helsinki, 2013) and other regulatory documents, which was confirmed by the local bioethics commission (protocol No. 167 dated 11/21/2022).

At the screening visit, all patients with arterial hypertension underwent correction of antihypertensive therapy: patients received an ACE inhibitor(perindopril arginine 5–10 mg) in combination with a calcium channel antagonist (amlodipine 5–10 mg per day).

Fifty-five patients who met the inclusion criteria were selected. According to the assigned treatment, patients were divided into two subgroups using the envelope method:

The main group(group 1, n=30) received combined antihypertensive therapy and was additionally prescribed dietary supplementation. Probiotic (Saccharomyces boulardii - $2.5\times10^9$ CFU, Lactobacillus acidophilus - $2.5\times10^9$ CFU, Lactobacillus rhamnosus - $1\times10^9$ CFU, inulin - 25 mg) at a dose of 2 capsules per day for 3 months (commercial name - Bazhana®, Sopharma). Patients in the comparison group (group 2, n=25) received only basic antihypertensive therapy without probiotics.

The effectiveness of treatment was assessed after 3 months of observation.

All patients in the main group and the comparison group were analyzed for the content of the main types of gut microbiome: Bacteroides, Firmicutes; the proportion of patients with a reduced content of Lactobacillus was determined. spp,(<10^7), Bifidobacterium spp,(<10^9), Prevotella spp.(<10^11), Acinetobacter spp.,(<10^6), Roseburia inulinivorans(<10^10), Faecalibacterium prausnitzii,(<10^8), F/B ratio was estimated. Material for analysis of the main group was collected before the start of antihypertensive therapy to avoid drug effects on the gut microbiome.

The collection and storage of the material was carried out in accordance with the instructions developed by the Diagen laboratory.

Real-time polymerase chain reaction was performed in the Diagen laboratory using a thermal cycler. Rotor-Gene 6000 (Qiagen, Germany).

Endothelial function was assessed by brachial artery ultrasound with assessment of endothelium-dependent (flow-dependent) vasodilation. Brachial artery diameter was measured at rest and after 5-minute occlusion of blood flow using a sphygmomanometer cuff inflated to 250 mm Hg. The percentage increase in artery diameter from baseline was calculated.

Statistical processing of the results was carried out using the EZR software package version 2.8 (Saitama Medical Center, Jichi Medical University, Japan), which is the graphical user interface for the R software package (The R Foundation for Statistics Computing, Austria).

Wilcoxon's W test was used to compare quantitative data within groups, and Fisher's exact test (with Yates' correction) was used for categorical variables. Normality of distribution was assessed using the Shapiro–Wilk test. Normally distributed data are presented as mean ± standard deviation; non-normally

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distributed data as median and interquartile range.

For repeated measurements over time, two-way repeated measures ANOVA was applied, followed by Bonferroni-corrected post hoc comparisons where appropriate. Effect sizes were calculated using Cohen's d for parametric tests and r for non-parametric comparisons.

**Results**

Table 1 shows the comparative assessment of the observation groups before the intervention.

*Baseline characteristics*

The groups were comparable in terms of demographic and clinical parameters. Age distribution and gender ratio did not differ significantly between groups. Baseline systolic and diastolic blood pressure, levels of IL-6 and IL-10, and endothelial function (FMD) were also similar.

Most microbiome indicators did not differ significantly at baseline, including the F/B ratio and the proportions of Firmicutes, Bacteroides, Lactobacillus, Bifidobacterium, Prevotella, Acinetobacter and Akkermansia.

**Table 1.** Comparative evaluation of observation groups before intervention.

| Indicator | group 1(n=30) | group 2(n=25) | p |
|---|---|---|---|
| Gender [n(%)]man | 15(50) | 13(52) | p=0.905 |
| Age, mean ± SD | 50.77±7.45 | 51.68±6.82 | p=0.640 |
| Systolic blood pressure, mm Hg. | 154 [ 145-158] | 155 [ 150-159 ] | p=0.263 |
| Diastolic blood pressure, mm Hg. | 93 [ 90-95] | 95 [ 93-96 ] | p=0.086. |
| Interleukin-6, pg /ml | 1.99±0.3323 | 1.992±0.2666 | p=0.976 |
| Interleukin-10, pg /ml | 3.785±1.519 | 3.779 ± 1.626 | p=0.992 |
| Flow-mediated dilation (FMD) of the brachial artery before and after limb ischemia, % | 6 [ 5-8 ] | 8 [ 6 - 10 ] | p=0.068. |
| F/B ratio | 6.22±2.752 | 6.248±1.939 | p=0.968. |
| Firmicutes spp, % | 70 [ 63-74 ] | 70 [ 62-74 ] | p=0.839. |
| Bacteroides spp, % | 10.75 [ 8.6-15.1 ] | 10.9 [ 8.9-13.5 ] | p=0.919. |
| Proportion of patients with reduced Lactobacillus content spp,(<10^7), % | 53.3 [ 4.9-71.3] | 72.0 [ 52.1-88.2 ] | p=0.255. |
| Proportion of patients with reduced Bifidobacterium content spp, (<10^9), % | 56.7 [95% CI 38.1-74.3] | 56.0 [95% CI 35.6-75.4] | p=0.827. |
| Proportion of patients with reduced Prevotella levels spp.(<10^11), % | 60.0 [ 95% CI 41.4 - 77.2 ] | 44.0 [95% CI 24.6-64.4] | p=0.367. |
| Proportion of patients with reduced Acinetobacter levels spp.,(<10^6), % | 23.3 [95% CI 9.7-40.6] | 16.0 [95% CI 4.1-33.6] | p=0.735. |
| Proportion of patients with reduced Roseburia content inulinivorans,(<10^10), % | 56.7 [95% CI 38.1-74.3] | 92.0 [95% CI 77.6-99.4] | p=0.007. |
| Proportion of patients with reduced Faecalibacterium content prausnitzii,(<10^8),% | 53.3 [95% CI 34.9-71.3] | 96.0 [95% CI 84.3-100.0] | p<0.001. |
| Proportion of patients with reduced Akkermansia content muciniphila,(<10^11), % | 76.7 [95% CI 59.4-90.3] | 80.0 [95% CI 61.4-93.5] | p=0.976. |

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However, two taxa showed significant between-group differences: Roseburia inulinivorans and Faecalibacterium prausnitzii, both of which were more frequently reduced in group 2. This baseline imbalance limits the interpretation of subsequent changes in these taxa.

Table 2 shows a comparative assessment of the two groups at the beginning and end of the observation.

**Table 2.** Comparative assessment of patient groups at the beginning and end of observation

| Indicator | group 1(n=30) | | p | group 2(n=25) | | p |
|---|---|---|---|---|---|---|
| | To | After | | To | After | |
| Systolic blood pressure, mm Hg. | 154 [ 145-158] | 123 [120-128] | p<0.001 | 155 [ 150-159 ] | 131 [129-135] | p<0.001 |
| Diastolic blood pressure, mm Hg. | 93 [ 90-95] | 81 [ 78-83] | p<0.001 | 95 [ 93-96 ] | 84 [ 83-86 ] | p<0.001 |
| Interleukin-6, pg /ml | 1.9 15 [1.75-2.23] | 1.815 [ 1.69-1.99 ] | p=0.014 | 1.96 [1.78-2.18] | 2.06 [1.96-2.15 ] | p=0.200 |
| Interleukin-10, pg /ml | 3.785±1.519 | 3.632±1.535 | p<0.001 | 3.78 ± 1.63 | 4.16±1.44 | p=0.266 |
| Flow-mediated dilation (FMD) of the brachial artery before and after limb ischemia, % | 6 [ 5-8 ] | 10 [ 9-12 ] | p<0.001 | 8 [ 6 - 10 ] | 11 [ 9-12 ] | p<0.001 |
| F/B ratio, % | 6.22±2.75 | 2.3 [ 1.8-2.8] | p<0.001 | 6.248±1.94 | 6.18± 1.89 | p=0.041 |
| Firmicutes spp, % | 70 [ 63-74 ] | 55 [47-59] | p<0.001 | 67.92 ± 8.69 | 67.08±8.27 | p=0.044 |
| Bacteroides spp, % | 10.75 [ 8.6-15.1 ] | 22 [ 20-27 ] | p<0.001 | 10.9 [ 8.9-13.5 ] | 11 [ 9-13.2 ] | p=0.838 |
| Proportion of patients with reduced Lactobacillus content spp,(<10^7), % | 53.3 [95% CI 4.9-71.3] | 13.3 [95% CI 3.5-28.3] | p=0.034 | 72.0 [95% CI 52.1-88.2] | 68.0 [95% CI 47.8-85.2] | p=0.066 |
| Proportion of patients with reduced Bifidobacterium content spp,(<10^9), % | 56.7 [95% CI 38.1-74.3] | 36.7 [95% CI 20.0-55.2] | p=0.839 | 56.0 [95% CI 35.6-75.4] | 52.0 [95% CI 31.8-71.9 ] | p=0.839 |
| Proportion of patients with reduced Prevotella levels spp.(<10^11), % | 60.0 [ 95% CI 41.4 - 77.2 ] | 56.7 [ 95% CI 38.1-74.3] | p=0.458 | 44.0 [95% CI 24.6-64.4] | 40.0 [ 95% CI 21.2 - 60.5] | p=0.541 |
| Proportion of patients with reduced Acinetobacter levels spp.,(<10^6), % | 23.3 [95% CI 9.7-40.6] | 20.0 [95% CI 7.5-36.7] | p=0.003 | 16.0 [95% CI 4.1-33.6] | 12.0 [95% CI 2.2-28.2] | p<0.001 |
| Proportion of patients with reduced Roseburia content inulinivorans, (<10^10), % | 56.7 [95% CI 38.1-74.3] | 60.0 [95% CI 41.4-77.2] | p=0.458 | 92.0 [95% CI 77.6-99.4] | 92.0 [95% CI 77.6-99.4] | p<0.001 |
| Proportion of patients with reduced Faecalibacterium content prausnitzii, (<10^8), % | 53.3 [95% CI 34.9-71.3] | 56.7 [95% CI 38.1-74.3] | p=0.720 | 96.0 [95% CI 84.3-100.0] | 96.0 [95% CI 84.3-100.0] | p<0.001 |
| Proportion of patients with reduced Akkermansia content muciniphila,(<10^11),% | 76.7 [95% CI 59.4-90.3] | 76.7 [95% CI 59.4-90.3] | p=0.006 | 80.0 [95% CI 61.4-93.5] | 80.0 [95% CI 61.4-93.5] | p=0.005 |

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*Dynamics within groups*

*Group 1 (with intervention)*

Patients receiving the intervention showed significant reductions in both SBP and DBP. Levels of IL-6 and IL-10 also decreased significantly.

The intervention resulted in marked shifts in the microbiome: F/B ratio decreased significantly, driven by a reduction in Firmicutes and an increase in Bacteroides; the proportion of patients with Lactobacillus deficiency decreased substantially.

Changes in Bifidobacterium, Prevotella, Roseburia, Faecalibacterium, and Akkermansia were not statistically significant.

*Group 2 (no intervention)*

Although SBP and DBP also decreased significantly, inflammatory markers IL-6 and IL-10 remained unchanged.

Microbiome changes were minimal. Statistically significant shifts in the F/B ratio and Firmicutes proportion were negligible in magnitude. Bacteroides levels remained stable.

No significant changes were observed in the proportions of patients with reduced Lactobacillus, Bifidobacterium, Prevotella, Roseburia, Faecalibacterium, or Akkermansia.

Table 3 shows comparative data between groups at the end of observation.

*Between-group comparison at the end of follow-up*

At the end of observation, blood pressure values remained significantly lower in group 1 compared with group 2, for both systolic and diastolic parameters (p<0.001 for both).

Group 1 also demonstrated a significantly lower IL-6 level (p<0.001), whereas IL-10 did not differ between groups.

Endothelial function, assessed by flow-mediated dilation (FMD), showed no significant differences between groups.

Marked distinctions were observed in the gut

**Table 3.** Comparative data of patient groups at the end of observation

| Indicator | group 1(n=30) | group 2(n=25) | p |
|---|---|---|---|
| Systolic blood pressure, mm Hg. | 123 [120-128] | 131 [129-135] | p<0.001 |
| Diastolic blood pressure, mm Hg. | 81 [ 78-83] | 84 [ 83-86 ] | p<0.001 |
| Interleukin-6, pg /ml | 1.815 [ 1.69-1.99 ] | 2.06 [ 1.96-2.15 ] | p<0.001 |
| Interleukin-10, pg /ml | 3.632±1.535 | 4.162±1.442 | p=0.196 |
| Flow-mediated dilation (FMD) of the brachial artery before and after limb ischemia, % | 10 [9-12] | 11 [ 9-12 ] | p=0.255 |
| F/B ratio | 2.3 [ 1.8-2.8] | 6.2 [ 5.6-7 ] | <0.001 |
| Firmicutes spp, % | 53.03±7.289 | 67.08±8.271 | p<0.001 |
| Bacteroides spp, % | 22 [20-27] | 11 [9-13.2] | p<0.001 |
| Proportion of patients with reduced Lactobacillus content spp,(<10^7), % | 13.3 [95% CI 3.5-28.3] | 68.0 [95% CI 47.8-85.2] | p<0.001 |
| Proportion of patients with reduced Bifidobacterium content spp,(<10^9), % | 36.7 [95% CI 20.0-55.2] | 52.0 [95% CI 31.8-71.8 ] | p=0.388 |
| Proportion of patients with reduced Prevotella levels spp.(<10^11), % | 68.0 [95% CI 47.8-85.2] | 40.0 [ 95% CI 21.2 - 60.5] | p=0.341 |
| Proportion of patients with reduced Acinetobacter levels spp.,(<10^6), % | 20.0 [95% CI 7.5-36.7] | 12.0 [95% CI 2.2-28.2] | p=0.662 |
| Proportion of patients with reduced Akkermansia content muciniphila,(<10^11), % | 76.7 [95% CI 59.4-90.3] | 80.0 [95% CI 61.4-93.5] | p=0.976 |

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microbiome profile. Group 1 had a substantially lower F/B ratio and a lower relative abundance of Firmicutes, while the proportion of Bacteroides was significantly higher compared with group 2 (all p<0.001).

Among individual taxa, reduced Lactobacillus levels were considerably more common in group 2 than in group 1. Differences in the prevalence of reduced Bifidobacterium, Prevotella, Acinetobacter, and Akkermansia levels did not reach statistical significance.

**Discussion**

*Summary of findings*

The results of our study demonstrate that additional probiotic therapy combined with standard antihypertensive treatment significantly reduced systolic and diastolic blood pressure and decreased systemic inflammation. These effects were accompanied by normalization of the Firmicutes/Bacteroidetes ratio and an increase in Bacteroides spp. No significant changes were observed in endothelial function over the 3-month follow-up.

*Interpretation and implications*

The results support the role of gut microbiota in the pathophysiology of arterial hypertension via modulation of inflammation and metabolic pathways. The lack of endothelial improvement may reflect the short intervention period, as vascular remodeling often requires longer exposure. Baseline imbalance in Roseburia inulinivorans and Faecalibacterium prausnitzii limits interpretation of changes in these taxa.

Overall, the findings reinforce evidence that probiotic supplementation can enhance antihypertensive therapy, are consistent with data presented in previous publications, and highlight the gut microbiome as a potential therapeutic target [13-15].

The observed decrease in blood pressure aligns with prior clinical trials showing that probiotic supplementation can enhance the efficacy of standard antihypertensive therapy. The reduction in IL-6 and partial normalization of IL-10 levels are consistent with previous reports demonstrating anti-inflammatory effects of probiotics in patients with metabolic or cardiovascular disorders. Changes in the gut microbiome composition, including the Firmicutes/Bacteroidetes ratio and Bacteroides spp., also reflect patterns reported in earlier studies linking dysbiosis with hypertension [16-18]. Further studies with larger samples and longer follow-up are needed to confirm long-term vascular effects.

**Conclusions**

Dietaryprobioticsupplementationeffectively corrected gut dysbiosis supplementation in patients with AH in combination with standard antihypertensive therapy contributes to a more effective reduction in blood pressure. After 3 months of observation in the main group (group 1), a significant decrease in systolic (p<0.001) and diastolic (p<0.001) blood pressure was achieved, as well as a significant decrease in the level of proinflammatory cytokine IL-6 (p=0.014) compared to the comparison group (group 2), where no such changes were observed.

Probiotic supplementation effectively corrected intestinal dysbiosis in patients in the main group. This is confirmed by a statistically significant decrease in the Firmicutes/ Bacteroidetes ratio (p<0.001), a decrease in the proportion of Firmicutes (p<0.001) and an increase in the proportion of *Bacteroides* spp. (p<0.001). In addition, a significant decrease in the number of patients with reduced Lactobacillus content was noted. spp. (p=0.034).

The results obtained confirm a direct relationship between the state of the gut microbiome and the level of systemic inflammation in patients with AH. Probiotic supplementation can be considered as an effective adjunct to correct gut dysbiosis, which contributes to improved blood pressure control and reduced inflammation, which is important for improving the prognosis of the disease. At the same time, no significant difference in endothelial function indicators between the groups was found at the end of the study (p = 0.255).

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**Conflict of interests**

The author declares the absence of a conflict of interest.

**AI Disclosure**

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No AI tools were used in the preparation of this manuscript

**Consent to publication**

The authors received consent to publish this work from all patients. All authors have read and approved the final version of the manuscript.

**Ethical approval**

The research protocol received approval from institutional Bioethics Committee (protocol №167, dated 11.21.2022)

**Author Contributions (CRediT taxonomy)**

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# Вплив пробіотичної суплементації на артеріальний тиск, системне запалення та ендотеліальну функцію у пацієнтів з есенціальною артеріальною гіпертензією

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***Анотація:*** *Актуальність пошуку нових підходів до лікування есенціальної артеріальної гіпертензії обумовлена її зростаючою поширеністю та високим рівнем смертності, що спонукає до пошуку нових методів терапії. Останні наукові дані вказують на важливу роль дисбалансу кишкового мікробіому, який може призводити до порушення кишкового бар'єру та розвитку хронічного низькоінтенсивного системного запалення. Це запалення є ключовим механізмом у патогенезі артеріальної гіпертензії та викликає ендотеліальну дисфункцію, що підтверджується вищими рівнями прозапальних цитокінів. Цей взаємозв'язок відкриває нові перспективи для корекції кишкового дисбіозу як терапевтичної стратегії, що має потенціал для поліпшення контролю над захворюванням. Метою даного проспективного дослідження було оцінити вплив дієтичної суплементації пробіотиком на показники артеріального тиску, системного запалення та ендотеліальної функції у пацієнтів з есенціальною артеріальною гіпертензією через корекцію кишкового дисбіозу. У дослідженні взяли участь п'ятдесят п'ять пацієнтів, які були рандомізовані на дві групи: основну групу (30 осіб), яка додатково до стандартної антигіпертензивної терапії отримувала пробіотичний комплекс, що включав Saccharomyces boulardii та Lactobacillus, та групу порівняння (25 осіб), що отримувала лише стандартну терапію. Тривалість спостереження становила 3 місяці. Усім учасникам проводилося комплексне клінічне обстеження з аналізом систолічного та діастолічного артеріального тиску, рівнів інтерлейкіну-6 та інтерлейкіну-10, оцінкою ендотелій-залежної вазодилятації плечової артерії, а також аналізом складу кишкового мікробіому. Дослідження встановило, що до початку втручання групи були зіставні за основними клінічними та демографічними показниками, за винятком достовірної різниці у частці пацієнтів зі зниженим вмістом Roseburia inulinivorans та Faecalibacterium prausnitzii, що обмежувало пряме порівняння динаміки цих таксонів. Після 3 місяців спостереження у пацієнтів основної групи досягнуто значущого зниження систолічного і діастолічного артеріального тиску, а також рівня прозапального цитокіну інтерлейкіну-6, тоді як у групі порівняння рівні запальних маркерів суттєво не змінилися. Аналіз мікробіому показав, що пробіотична суплементація ефективно скоригувала кишковий дисбіоз, що підтверджується значним зниженням співвідношення Firmicutes та Bacteroidetes, зменшенням частки Firmicutes та зростанням частки Bacteroidetes*

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*і Lactobacillus. Водночас, порівняльний аналіз не виявив статистично значущої різниці у показниках ендотеліальної функції між групами. Отримані результати підтверджують, що дієтична суплементація пробіотиком є ефективним допоміжним методом для корекції кишкового дисбіозу, що сприяє поліпшенню контролю артеріального тиску та зниженню системного запалення у пацієнтів з есенціальною артеріальною гіпертензією, що є важливим для покращення прогнозу перебігу захворювання.*

**Ключові слова** артеріальний тиск, ендотеліальна функція, кишковий мікробіом, системне запалення