



Effect of Probiotic Supplementation in Parkinson's Disease: A Systematic Review and Meta-analysis

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Objectives

Parkinson's disease (PD) is the second most common neurodegenerative disease worldwide. Gut dysbiosis is hypothesized to cause PD (Fig 1); therefore, whether probiotics can be used as adjuvants in the treatment of PD is being actively investigated. We performed a systematic review and meta-analysis to evaluate the effectiveness of probiotic therapy in PD patients.

Method

PUBMED/MEDLINE, EMBASE, Cochrane, Scopus, PsycINFO and Web of Science databases were searched till February 20, 2023. The meta-analysis used a random effects model, and the effect size was calculated as mean difference or standardized mean difference. We assessed the quality of the evidence using the Grade of Recommendations Assessment, Development and Evaluation approach.

Results

Eleven studies involving 840 participants were included in the final analysis. This meta-analysis showed **high-quality evidence of improvement in Unified PD Rating Scale Part III motor scale** (standardized mean difference [95% confidence interval]) (-0.65 [-1.11 to -0.19]), **non-motor symptom** (-0.81 [-1.12 to -0.51]), and **depression scale** (-0.70 [-0.93 to -0.46]). **Moderate to low quality evidence of significant improvement was observed in gastrointestinal motility** (0.83 [0.45-1.10]), **quality of life** (-1.02 [-1.66 to -0.37]), **anxiety scale** (-0.72 [-1.10 to -0.35]), **serum inflammatory markers** (-5.98 [-9.20 to -2.75]), and **diabetes risk** (-3.46 [-4.72 to -2.20]) (Fig 2). However, there were no significant improvements in Bristol Stool Scale scores, constipation, antioxidant capacity, and risk of dyslipidemia. **In a subgroup analysis, probiotic capsules (1.06 [0.85 to 1.28]) more improved gastrointestinal motility compared to fermented milk (0.55 [0.33 to 0.77]) (Fig 3).**

Conclusion

Our study shows high-quality evidence that probiotics improve motor function, non-motor symptoms, and reduce depression in PD patients. Probiotic supplementation may be an affordable and safe adjuvant treatment option for PD management. To establish more trustworthy evidence on the potential benefits of probiotics for PD, it is necessary to conduct larger randomized controlled trials and long-term follow-up studies. The studies should be subdivided based on factors such as the severity of the disease, type and dosage of probiotics, duration of intervention, and they should include assessments of motor and cognitive function as well as other predictors of disease.

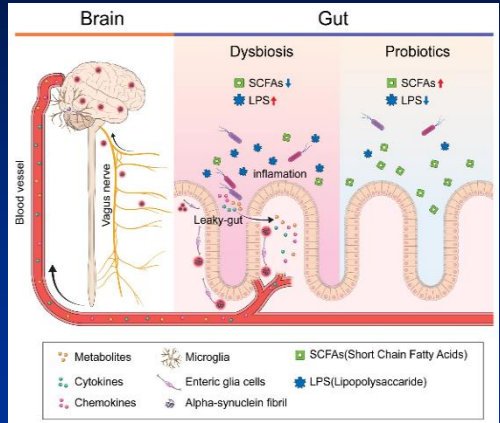


Figure 1. An overview of gut dysbiosis and the effects of probiotics in Parkinson's disease.

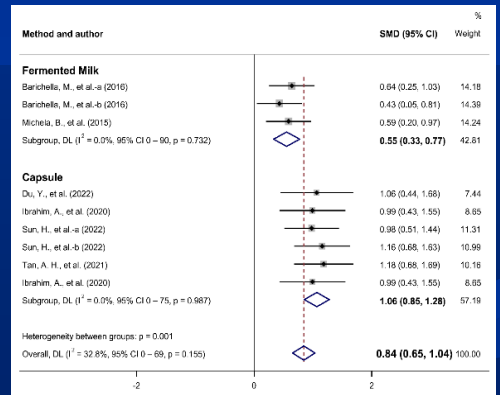


Figure 3. Subgroup analysis of the effects of probiotics on gastrointestinal motility by administration method.

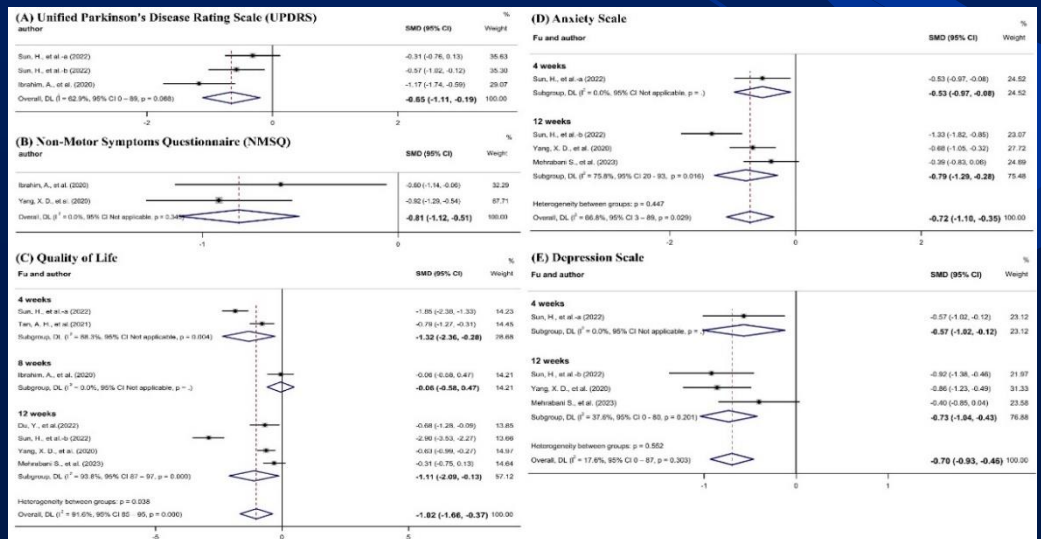


Figure 2 Meta-analysis of the effects of probiotics on Parkinson's disease-related scales and mental health.