

Short Communication on Psychobiotics Therapy for Depression: Noval Therapy

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Abstract: Psychobiotics were previously termed as probiotics, which was termed after proving to have some positive effects on mental health^{1,3,21}. As a folklore data probiotics were said to have effects in the brain by reducing depression. The gut microbiota is involved in the regulation of cognition, mood, anxiety, and pain, and can impact cognitive functions by producing neuroactive substances or releasing bacterial by-products and metabolites². The main aim of our study is to determine the efficacy of Psychobiotics on improvement in depression and cognitive disorder. The Primary objective is to positively assess the efficacy of the Psychobiotics supplementation on the patients with depression and also to check the improvement in the cognition. The Secondary objectives are to determine the longitudinal effect of Psychobiotics supplementation on depression and cognitive disorder, to determine the efficacy of the Psychobiotics supplementation in reducing depression and improve cognitive disorder to draw a relationship between post-interventional change in depression and cognitive disorder. **Methods:** In our study, a total of 10 patients were included in the study, who were given with questionnaire PHQ 9 and also the baseline parameters were collected and compared with the 1st-month readings to check the effects of psychobiotics. **Results:** This study proved to have a significant difference in the treatment group compared to the control group, proving that there is a positive effect of psychobiotics on depression ($p = 0.05$).

Keywords: Lactobacillus, Bifidobacter, Depression, PHQ9 scale

1. Introduction

Psychobiotics (probiotics) were previously elucidated as live bacteria ingested in the human gut, which confers mental health benefits through interactions with commensal gut bacteria^{1-5,19,20}. The gut microbiota is involved in the regulation of cognition, mood, anxiety, and pain, and can impact cognitive functions by producing neuroactive substances or releasing bacterial by-products and metabolites^{2,21}. In 2001, the World Health Organization (WHO) stated that probiotics, as live micro-organisms, when taken in certain amounts, lead to health benefits for the host³. The brain and the gut are connected in a partnership called the gut-brain axis. The gut-brain axis (GBA) consists of bidirectional, biochemical communication between the central and the enteric nervous system, linking the emotional and cognitive centers of the brain with peripheral intestinal functions. The primary information connection between the brain and the gut is the vagus nerve^{4,15,26}. The observation that common categories of GI diseases often display correlation with another psychiatric comorbidity that includes depression and anxiety in up to 80% of patients, supports the possibility that alteration of microbiota can affect CNS function⁵. The psychophysiological effects of Psychobiotics fall into the following three categories: (i) Psychological effects on emotional and cognitive processes. (ii) Systemic effects on the hypothalamic-pituitary-adrenal (HPA) axis and the glucocorticoid stress response, and inflammation which is often characterized by aberrant cytokine concentrations. Pro-inflammatory cytokines share a strong and well-studied positive association with psychiatric conditions such as depression⁵. (iii) Neural effects on neurotransmitters and proteins. Relevant neurotransmitters include γ -aminobutyric acid (GABA) and glutamate, which control neural excitation-inhibition balance. Proteins include brain-derived neurotrophic factor (BDNF), which plays a crucial role in learning and memory processes, including spatial learning, extinction of conditioned fear, and object recognition^{5,6,24}. Increased biomarkers of oxidative

stress^{18,25}, inflammation and chronic neuroinflammation are reported to be associated with many neurodegenerative disorders of central nervous systems⁶. Probiotics may improve mental health by increasing the availability of tryptophan and increasing serotonin⁷. Tryptophan intake increases brain serotonin metabolism and enhances memory. Serotonin synthesis occurs in the periphery within the gut neurons which is produced by gut microbiota⁸. Recently, several studies have postulated the importance of gut microbiota in the development and function of the central nervous system (CNS) through specific channels, such as metabolic, neuroendocrine, and immune pathways^{3,22}.

Despite the availability of treatment for depression, the improvement of the disease is often limited, hence this study is aimed to develop a supplemental therapy for the treatment of mental health. As probiotics are said to have a positive effect on depression by increasing the neurotransmission and reducing the oxidative stress levels, this can be a good alternative for the improvement in the depression of some patients and also this supplemental therapy will have no side effects and will have a positive effect on the disease, which is the main purpose of this study.

The primary aim of the study is to determine the efficacy of Psychobiotics on improvement in depression.

The *primary objective* of this study was designed to positively assess the efficacy of the Psychobiotics supplementation on the patients with depression and also to check the improvement in the cognition.

The *secondary objective* of this study is to determine the longitudinal effect of Psychobiotics supplementation on depression and cognitive disorder, to determine the efficacy of the Psychobiotics supplementation in reducing depression and improve cognitive disorder and to draw a relationship between post-interventional change in depression and cognitive disorder.

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The Study Design used here is a pre-post study, with a longitudinal design. Our study was planned to have a Study Duration of 3 months were the Depression Questionnaire (PHQ 9) are administered to check the depression score of the patients.

A Total of 10 patients were divided into 2 groups with Group A consisting of patients with depression not taking Psychobiotics (Control group); Group B, patients with depression prescribed with Psychobiotics (Treatment group). The approval for the study was got prior to the commencement of the study from the Institutional Ethics Committee of VISTAS. The study protocol was explained to all subjects in their native language prior to enrolment. Written informed consents was obtained from subjects willing to participate in the study who are diagnosed with depression. Administration of the questionnaire was done with pre and post-intervention. After collection of baseline demographics, the patients are randomly divided into control and the treatment group. The patients who are on treatment group are administered with Psychobiotics which contains Lactobacillus and Bifidobacterium with a dose of 2 billion CFU for a period of 1 month. The questionnaire was administered on the baseline and 1st month of post-treatment. Selection of patients was based on Inclusion criteria.

Patients of both genders with the age limit of 50 years and above, who are diagnosed with depression as per the NICE guidelines for mental health (National Institute for Health and Care Excellence) and willing to provide written informed consent were selected and included in the study. Patients with metabolic disorders and other conditions which can alter the neuronal function, patients who are already using probiotics for past 2 months, patients on antibiotics, antifungals which can interact with Psychobiotics, patients with co-morbid conditions where, probiotic use is contraindicated, patients with psychiatric illnesses or any other pathological condition that restricts their participation, pregnant and lactating women and patients who are not willing to give a written informed consent form were excluded from the study.

The study results were recorded and analyzed using Microsoft Excel and SAS programming. Descriptive summary statistics were presented as mean (SD) or median (minimum, maximum). Choice of suitable inferential statistical method depends on data normality. 95% confidence level is maintained to minimize type I error and type II error. So P-value < 0.05 was considered statistically significant. The relationship between the post-interventional changes was determined using Pearson's correlation as data follows Gaussian distribution. Paired T test was used for longitudinal comparison.

As a result of the analysis, people with age above 50 years of both genders were affected equally with depression³. Most of the people affected have a risk of occupational stress which was the main cause of depression⁷⁻⁹. Not only occupational stress personal history also had a great impact on depression in this study. 90 % of people who are diagnosed with depression are not taking curd in their daily routine as per my study.

The patients in the Group B cooperated well for the study and they adhered to psychobiotics therapy well which showed a good result in the study. All the 10 patients were mild to moderate depressive patients and the patients who were on treatment group showed good improvement with the therapy than the Group A patients (Fig 1). The ANOVA repeated measures for a relationship with the post-interventional changes (probiotic supplementation and depression scale levels) was found to have a significance of $P = 0.05^{3,10-17}$ (Fig 2). This shows that the probiotic therapy was effective in improving the depression through the vagus nerve which helps regulate few hormones which are responsible for mood-related changes and also reduces the oxidative stress in brain^{1,2,3,18,25}.

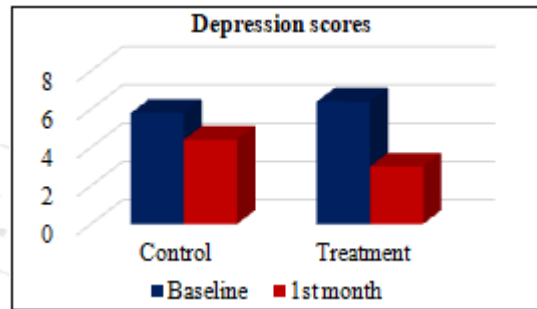


Figure 1: Depression score of the patients in control and treatment group before and after treatment



Figure 2: Difference between the PHQ9 scores in control and treatment group after the therapy

Our study states that the psychobiotics have a positive effect on depression. This supplemental therapy is cost effective and also it does not have any side effects. As the age increases the brain function decreases and also due to external factors the depression increases in people above 55 years of age. So this supplemental therapy will be of great use. Even though this study is carried out in other countries, in India the effect of psychobiotics in depression is not yet proved. Our study will pave way for new findings in this field in India.

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