RESEARCH ARTICLE

Prospective Observational Study to Assess Quality of Life before and after Introduction of Probiotic Nutraceuticals and Probiotic Food (Curd) in Subjects with Depression: A Comparative Analysis

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Abstract

Background: Depression poses a pervasive challenge to individuals' well-being, prompting the exploration of alternative therapies due to the limited efficacy of traditional treatments. Recent research has investigated the potential therapeutic role of probiotics, including probiotic nutraceuticals and the probiotic food curd, in addressing mental health concerns.

Materials and methods: This 28-day prospective observational study aimed to assess the impact of probiotic interventions on the quality of life in individuals aged 18–60 diagnosed with mild to moderate depression according to ICD-10 criteria. Ninety participants were divided into three groups: One group received probiotic nutraceuticals along with escitalopram, another group received probiotic food (curd) along with escitalopram, and the third group was treated with escitalopram alone. The World Health Organization (WHO) quality of life (WHOQOL-BREF) scale measured participants' quality of life at the study's initiation and conclusion. Data analysis utilized comparative and statistical methods to evaluate the intervention's impact.

Results: Significant improvements in quality of life were observed in individuals with depression after 28 days of treatment. The probiotic group exhibited the most substantial increase in WHOQOL-BREF scores, rising significantly from an initial mean of 34.73 ± 1.55 on day 0 to 46.72 ± 2.47 on day 28 ($p < 0.001$). In comparison, the escitalopram group showed an increase from 34.58 ± 1.82 to 42.37 ± 2.54 ($p < 0.001$), and the curd group improved from 35.28 ± 1.35 to 44.43 ± 2.36 ($p < 0.001$).

Conclusion: This study highlights the potential of probiotics as valuable adjuncts to traditional treatments for major depressive disorder (MDD). The findings emphasize holistic approaches to mental health management, opening new avenues for improving the lives of individuals grappling with depression. Despite limitations, this research encourages further exploration and applications of probiotics in mental health care.

Keywords: Curd, Depression, Mental health, Probiotics, Probiotic nutraceuticals, Prospective observational study, Quality of life, WHOQOL-BREF.

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Introduction

Depression a serious and widespread mental disorder affects a significant portion of the global population. It is characterized by a persistent depressed mood, a loss of interest or pleasure in activities, and can extend over prolonged periods of time. Unlike regular mood changes, depression can have a profound impact on various aspects of life, influencing relationships with family, friends, and one's wider community. It can also disrupt performance at school and work, making it a pressing concern in public health. Notably, this condition affects more women than men, with an estimated 5% of adults worldwide grappling with depression.[1]

Depression and psychological stress pose significant challenges with limited effective treatments. Recent research investigates the gut-brain axis and the potential of probiotics to impact mental health. Probiotics have been shown to reduce depressive symptoms through their anti-inflammatory effects, but further rigorous trials are necessary to confirm these findings.[2] The gut-brain-microbiome axis is a focal point of research, highlighting the potential of probiotics in mitigating depressive disorders.[3] This complex relationship between the gut microbiota and mental health has led to the concept of "psychobiotics" that can enhance mental well-being through microbiota-modifying properties.[4] Probiotics have historical use in addressing mental health, but only recent comprehensive clinical trials have explored their potential in treating depression.[4]

Recent fMRI studies reveal neural correlates of probiotic-induced mood improvements.[5] One study demonstrates reduced

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depressive symptoms with a specific probiotic strain, supporting its therapeutic potential.[6] Research suggests probiotics modulate inflammatory markers, linking gut health to mental well-being.[7] Another study highlights the enteric nervous system's role in the gut-brain axis, informing potential interventions.[8]

Understanding the potential benefits of probiotics in managing depression is of paramount importance, as it could offer new, more effective, and holistic approaches to improving the lives of individuals grappling with this debilitating condition. This study seeks to provide valuable insights into this area of research and contribute to the growing body of knowledge on the role of probiotics in mental health.

The World Health Organization (WHO) defines quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. Understanding the influence of depression and its potential alleviation through probiotics on this multi-dimensional construct is of paramount importance.[9] Therefore, this study aims to assess the impact of probiotic nutraceuticals and probiotic food (curd) on the quality of life in individuals with depression, contributing to the ongoing exploration of probiotics as a therapeutic approach to mental health. This research seeks to bridge the gap between research and practice, offering new ways to improve the lives of individuals with depression.

Aim

To investigate the impact of probiotic nutraceuticals and probiotic food (curd) on the quality of life in individuals with depression.

Objectives

- To assess the baseline quality of life using the WHO quality of life (WHOQOL-BREF) scale before introducing probiotics.
- To examine changes in quality of life as measured by the WHOQOL-BREF scale after a 28-day probiotic intervention.
- To compare the quality-of-life outcomes between probiotics and standard antidepressant therapy.

Materials and Methods

The study was conducted at MGM Medical College, Indore, with approval from the institutional ethical committee (Approval No. EC/MGM/FEB-20/63). Participants were recruited in the Outpatient Department (OPD), adhering to specified inclusion and exclusion criteria.

For accurate curd (probiotic food) volume measurement, standardized measuring glasses were provided, and participants were instructed to fill the glass to the designated volume mark. Practical demonstrations ensured correct self-measurement of the prescribed curd volume at each dose. Exclusion criteria encompassed comprehensive psychiatric assessments, structured interviews, and history checks. Individuals with other psychiatric illnesses were explicitly excluded from the study to focus on the specific condition under investigation.

Randomization was not employed in this prospective observational study. The selection of treatment groups was based on participant preferences and the availability of treatment options. To ensure medication adherence, measures included informed consent, counseling sessions, regular follow-up assessments, and medication diaries. Participants were educated about the exclusive use of the provided probiotics to discourage alternative probiotic or dietary supplement use.

Inclusion Criteria

The inclusion criteria for this study encompassed individuals meeting specific conditions. Participants were required to be diagnosed with a mild or moderate depressive episode according to the ICD-10 classification. Additionally, subjects diagnosed with mild or moderate depression by senior consultant psychiatrists, who were receiving Escitalopram as monotherapy, were included. Individuals or those residing with them (sharing the same house and kitchen) were required to have a minimum level of primary education. The age range for inclusion was set between 18 and 60 years for individuals diagnosed with depression. Furthermore, participants had to be antidepressant-free for the preceding four weeks, with the severity of depression assessed using the Hamilton Depression Rating Scale (HDRS) to specifically target those with mild to moderate depression. Lastly, individuals willing to provide informed consent were eligible for inclusion in the study.

Exclusion Criteria

The exclusion criteria for participant selection in this study were defined to ensure the specificity and homogeneity of the sample. Subjects with depression who were concurrently diagnosed with inflammatory bowel disease and short bowel syndrome were excluded from participation. Additionally, individuals experiencing diarrhea or constipation in the last two weeks were not eligible for inclusion. Subjects with depression who had recently consumed antibiotics or were currently taking antibiotics within the past 4 weeks were excluded to mitigate potential confounding factors. Immunodeficiency syndromes also constituted an exclusion criterion for participant selection. Furthermore, individuals with bipolar depression, psychotic depression, or any other psychiatric illnesses were excluded from the study. Subjects with depression who did not provide informed consent were not considered for inclusion. Pregnant or lactating subjects with depression were also excluded, along with individuals diagnosed with severe depression and suicidal depression. Those with depression who were taking medications such as anti-inflammatory, antitubercular, antiviral, antiprotozoal, and antifungal drugs in the past 4 weeks were excluded. Lastly, subjects with depression presenting a history of lactose intolerance were not included in the study.

This prospective observational study employed purposive sampling and included 90 subjects aged 18–60, diagnosed with depression based on ICD-10 criteria and assessed using the HDRS. The sample size of 90 participants, divided into three groups of 30, was chosen to meet the minimum requirement for obtaining statistically significant results. This approach ensures adequate statistical power to assess the impact of probiotics in conjunction with Escitalopram on depression severity, adhering to established research standards.

The study spanned four weeks, with follow-up assessments on day 14 and day 28. Thirty subjects received Escitalopram 10 mg, thirty received Escitalopram 10 mg combined with 120 mL of curd, and the remaining thirty received Escitalopram 10 mg alongside a probiotic capsule.

Throughout the course of this study, the WHOQOL-BREF quality of life scale was administered to each patient at two points: On the

first day of the study and the 28th day, upon completion of the intervention.

Assessment of Quality of Life

Quality of life was evaluated using the abbreviated WHOQOL-BREF[9] scale, a reliable and validated tool developed by the World Health Organization. The WHOQOL-BREF[9] consists of 26 items designed to comprehensively assess an individual's perception of their quality of life and general health.

This tool encompasses a wide array of aspects, encompassing not only an individual's overall quality of life and general health but also exploring four main domains. These domains include physical health, psychological well-being, environmental health, and social relationships. In this regard, seven items were allocated to gauge physical health, six items to delve into psychological health, eight items to scrutinize environmental health, and three items to probe social relationships.

Each of the 26 items within the WHOQOL-BREF was subjected to a scoring system that ranged from one to five, with one signifying the lowest perceived quality of life and five representing the highest level of well-being. Subsequently, the average score for the items within each domain was calculated, yielding the domain mean. To ensure comparability with the full WHOQOL tool, the domain mean was multiplied by a factor of four.

Importantly, it should be noted that the rating was structured in a positive direction. Therefore, a higher score signified an elevated quality of life.

Hamilton Depression Rating Scale (HDRS)

The HDRS, also known as the HRSD or simply HAM-D, is a widely used clinician-administered assessment tool designed to quantify the severity of depressive symptoms in individuals with mood disorders, particularly depression.

The HDRS consists of a series of questions or items that assess various symptoms commonly associated with depression, including mood, feelings of guilt, suicidal ideation, insomnia, and agitation, among others. Each item is rated based on the patient's self-report or clinician's observation, and scores are assigned according to predefined criteria. The HDRS includes 17 items, with each item scored on a standardized scale. The total score provides an indication of the severity of depression, with higher scores indicating more severe symptoms.

Statistical Analysis

The data collected through this tool were subjected to various statistical methods, including comparative analyses conducted using the Chi-square (χ^2) test and Tukey's Honest significance difference test. These analyses were performed using the Statistical Package for Social Sciences (SPSS) version 20 (IBM SPSS Statistics, Armonk, NY), with a predetermined level of significance set at 5% ($p < 0.05$).

Results

In this study, the age groups exhibited the highest representation (32%) within the 18–30 years range and the lowest (21%) among individuals aged 40–50 years. Regarding gender distribution, the majority (53.3%) were females, while the minority (46.7%) were males. In terms of marital status, most participants (70.0%) were married, with a smaller proportion (30.0%) being unmarried. The data on religious affiliation indicated that the largest group (80.0%) identified as Hindu, whereas the smallest group (20.0%) belonged to the Muslim community. Regarding education levels, the highest representation (22.2%) was among those with a middle school certificate, and the lowest (10%) was among those with a post high school diploma.

In terms of total illness duration, the highest frequency (37.8%) of patients reported an illness duration between 1 and 6 months, followed by an equal frequency (37.8%) with illness durations exceeding 12 months. The lowest frequency (24.4%) was observed in patients with illness durations ranging from 6 to 12 months. Regarding family history of depression, the majority of patients (93.3%) did not have a recorded family history of depression, while a minority (6.7%) had a positive family history of depression.

On examination of the obtained results, it became evident that the comparison of mean WHOQOL-BREF scores among patients, taking into consideration different treatment types and the passage of time, showed statistically significant differences ($p < 0.05$). This statistical significance underscores the substantial impact of the interventions on the patient's quality of life.

It was observed that the transition from day 0 to day 28 resulted in a significant increment in the WHOQOL-BREF scores, although the magnitude of change varied among the distinct treatment groups. Specifically, the probiotic group exhibited a slightly more substantial increase, with scores rising from an initial mean of 34.73 ± 1.55 on day 0 to 46.72 ± 2.47 on day 28. This observation was significant when contrasted with the changes observed in the escitalopram group, where the WHOQOL-BREF scores progressed from an initial mean of 34.58 ± 1.82 on day 0 to 42.37 ± 2.54 on day 28. Similarly, the curd group displayed a marked improvement in scores, increasing from an initial mean of 35.28 ± 1.35 on day 0 to 44.43 ± 2.36 on day 28 (Table 1).

The detailed outcomes, as presented in Table 2 suggest that patients in the probiotic group experienced a more significant improvement in their quality of life compared to those in the escitalopram and curd groups over the study period (Tables 3 and 4).

Discussion

The findings of our study demonstrate that the mean scores on the WHO-BREF scale, a validated tool for assessing quality of life, exhibited a substantial improvement when comparing patients across different treatment days and various treatment types. This

Table 1: Family history of depression and treatment duration

Family history of depression	*Frequency*	*Percent*
Absent	84	93.3
Present	6	6.7
Total	90	100.0
Total duration of illness (in months)		
1–6	34	37.8
6–12	22	24.4
>12	34	37.8
Total	90	100.0

Note: This table summarizes patient characteristics regarding family history of depression and illness duration. It presents frequencies and percentages for absence/presence of family depression history and duration categories (1–6 months, 6–12 months, >12 months) among 90 participants.

Table 2: Comparison of mean WHOBREF of different treatment groups in different days

Days treatment group	*Day 0 WHOBREF*	*Day 28 WHOBREF*	*p-value (According to paired 't')*
Escitalopram	34.58 ± 1.82	42.37 ± 2.54	0.027*
Escitalopram + Curd	35.28 ± 1.35	44.43 ± 2.36	<0.001**
Escitalopram + Probiotic	34.73 ± 1.55	46.72 ± 2.47	<0.001**
p-value (according to ANOVA)	0.948	0.959	*N* = 90

Note: Table 2 compares Mean WHO-BREF scores for treatment groups on days 0 and 28 (Mean ± SD). *p*-values (*$p < 0.05$, **$p < 0.01$) from Tukey's test show significant differences. Total participants are 90. Statistically significant differences were found between days of treatment ($p = 0.027$) and each treatment type ($p < 0.001$). No significant differences between each day of treatment and treatment type ($p = 0.948$, $p = 0.959$).

Table 3: Sociodemographic characteristics of study participants

Demographic data	*Frequency*	*Percentage*
Age (years)		
18–30	28	32
30–40	22	24
40–50	19	21
50–60	21	23
Sex		
Female	48	53.3
Male	42	46.7
Marital status		
Married	63	70
Unmarried	27	30
Religion		
Hindu	72	80.0
Muslim	18	20
Education		
Graduate/Postgraduate	18	20
Post high school Diploma	9	10
High school certificate	14	15.6
Middle school certificate	20	22.2
Primary school certificate	13	14.4
Illiterate	16	17.8

Note: This table outlines key sociodemographic characteristics of 90 study participants, including age distribution, gender, marital status, religion, and education levels.

Table 4: Mean HDRS scores at baseline (day 0) and day 28

Group	*Baseline (Day 0)*	*Day 28*
Probiotic nutraceuticals	12.50 ± 0.50	5.50 ± 0.84
Probiotic food (Curd)	12.43 ± 0.43	6.70 ± 0.90
Standard antidepressant therapy (Escitalopram)	12.67 ± 0.42	7.07 ± 0.94

Note: This table displays the mean HDRS scores (± standard deviation) for each treatment group at baseline (day 0) and day 28.

highlights the effectiveness of these interventions in elevating the overall quality of life experienced by our study participants.

Furthermore, our analysis revealed that the comparative assessment of mean WHO-BREF scores between different treatment days and treatment types showed statistically significant results. Notably, there were no significant variations observed when comparing the effects of each day of treatment across different treatment types.

We observed a moderate yet meaningful increase in WHO-BREF scores over the 28-day study period among participants in the probiotic group. The scores displayed a positive pattern, starting at 34.73 ± 1.55 on day 0 and improving to 46.72 ± 2.47 by day 28. In comparison, the escitalopram-only group showed an increase from 34.58 ± 1.82 on day 0 to 42.37 ± 2.54 on day 28. Similarly, the curd group displayed an increase, with scores rising from 35.28 ± 1.35 on day 0 to 44.43 ± 2.36 on day 28.

These collective outcomes signify that participants in the probiotic group show a more substantial improvement in their quality of life in comparison to their counterparts in the escitalopram and curd groups throughout the duration of our study.

Our findings align with the study done by Pinto-Sanchez MI et al.[10] on patients with irritable bowel syndrome, revealing that the probiotic BL (Bifidobacterium longum) significantly reduced depression scores and enhanced quality of life. Similarly, Kommers et al.[11] carried out a randomized, double-blind, placebo-controlled study on female university students with intestinal constipation, demonstrating that probiotic supplementation positively impacted the quality of life.

The findings from multiple studies highlight the potential of probiotics in improving mental health and depressive symptoms. Kazemi et al.[12] reported a significant reduction in depression scores with probiotic supplementation in patients with major depressive disorder (MDD). Slykerman et al.[13] discovered that *Lactobacillus* rhamnosus HN001 supplementation during pregnancy and postpartum led to lower depression and anxiety scores in mothers. Akkasheh et al.[14] demonstrated that probiotic intake for 8 weeks reduced beck depression inventory scores, insulin levels, insulin resistance, and high-sensitivity C-reactive protein concentrations in MDD patients. These findings collectively suggest that probiotics may offer valuable support in alleviating depressive symptoms and enhancing mental well-being.

Additionally, several studies contribute valuable insights into the potential benefits of probiotics in individuals with MDD. Ghorbani et al.[15] reported that patients receiving a symbiotic capsule (probiotic capsule plus fluoxetine) experienced a greater reduction in HAM-D scores compared to those receiving placebo (placebo plus fluoxetine). Similarly, Kazemi et al. found that probiotic supplementation containing lactobacillus and Bifidobacterium strains led to a significant improvement in beck depression inventory scores compared to placebo in individuals with MDD.[12] Moreover, a meta-analysis by Nikolova EL et al. found a beneficial effect of probiotics in patients with MDD receiving antidepressants, though not with probiotic monotherapy.[16] These findings collectively emphasize the potential synergistic effects of combining probiotics with traditional antidepressant therapies and highlight the nuanced role of probiotics in augmenting mental health outcomes in individuals with MDD.

The reasons behind these improvements in the probiotic and curd groups are multifaceted. Notably, probiotic intake may contribute to better gut health. The reintroduction or

supplementation of probiotic bacteria in the gut, facilitated through dietary means, may have positive effects. Such interventions can potentially activate the hypothalamic-pituitary axis via the vagus nerve, reducing stress.[17] Furthermore, probiotic bacteria may lead to increased production of serotonin and other neurohormones.[18] These mechanisms offer a promising pathway to enhance quality of life, making them particularly valuable in the context of depression treatment.

The statistically significant differences in mean WHO-BREF scores between patients at the beginning and end of the 28-day treatment period could be attributed to the consistent administration of escitalopram, a well-established SSRI in depression treatment, across all treatment groups.[19]

Study has shed light on the promising potential of probiotics and curd as valuable adjuncts to traditional treatments for MDD. Future studies should investigate the long-term effects of probiotics and curd supplementation on the quality of life of patients with MDD. Additionally, studies should explore the optimal dosage and duration of treatment for these interventions.

Limitations

This study's limitations include a relatively small sample size, which could have been expanded to yield more representative results for the entire population. Moreover, the use of purposive sampling for patient selection in each treatment group introduced potential researcher bias; employing randomized sampling methods could have minimized this bias. Additionally, the absence of a placebo group hindered a comprehensive comparison of results among all three treatment groups. While all groups received escitalopram, the study missed the opportunity to investigate probiotics and curd as standalone treatments rather than as adjuncts to escitalopram, which might have provided a more thorough assessment of their efficacy in individuals with depression.

Conclusion

Our study assessed the impact of probiotics, both in the form of probiotic capsules and curd, on the quality of life of individuals with depression. The results demonstrated a significant improvement in the quality of life of participants in the probiotic group over the 28-day study period. These findings align with previous research, emphasizing the potential of probiotics as valuable adjuncts to traditional depression treatments. However, we acknowledge the study's limitations, such as a relatively small sample size and the absence of a placebo group, which should be addressed in future research. In summary, our study highlights the promising role of probiotics in enhancing the well-being of individuals with depression.

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