International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898
Received: 04-07-2026, Accepted: 04-08-2026, Published: 19-08-2026
Volume 11, Issue 3, 2026, Page No. 199-201

Impact of consumption of probiotics and prebiotics on mental health

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DOI: https://doi.org/10.66856/ijfsn.2026.11.3.11145

Abstract
Mental health problems such as stress, anxiety, depression, are increasingly common among young adults due to academic pressure, unhealthy lifestyle practices, and poor dietary habits. Probiotics and prebiotics help to maintain a healthy gut microbe and may influence mental health through the gut-brain axis. This study aimed to assess the impact of probiotic and prebiotic consumption on mental health among young adults. A cross-sectional correlational study was conducted among 100 college-going young adults using a structured questionnaire that included demographic details, probiotic and prebiotic assessment, and standardized mental health assessment scales. Mental health was assessed using the Perceived Stress Scale (PSS10), Generalized Anxiety Disorder Scale (GAD-7), and Patient Health Questionnaire (PHQ-9). Statistical analysis was performed using descriptive statistics and Spearman's rank correlation test. Data were analyzed using descriptive statistics and Spearman's rank correlation test.The results showed a very weak negative correlation between probiotic consumption and mental health score ($\rho = -0.09097$, $p = 0.368$) and between prebiotic consumption and mental health score ($\rho = -0.01866$, $p = 0.854$). Both associations were not statistically significant ($p > 0.05$). The study concluded that no significant association was found between probiotic and prebiotic consumption and mental health of the participants.

Keywords: Probiotics, prebiotics, mental health, stress, anxiety, depression, young adults

Introduction
Mental health disorders such as depression, anxiety, and stress are increasing worldwide and have become major public health concerns. Lifestyle changes, unhealthy dietary habits, academic pressure, and psychological stress are important factors contributing to mental health problems. Regular consumption of foods rich in probiotics and prebiotics may contribute to better and improve the quality of life.

Relationship between Consumption of Probiotics and Prebiotics and Mental Health
Probiotics introduce beneficial bacteria into the gastrointestinal tract, whereas prebiotics promote the growth of existing beneficial microbes. These dietary components help maintain intestinal balance and support communication between the digestive system and the brain. Fermented foods such as curd and other probiotic rich foods along with fibre rich foods support the growth and activity of beneficial microorganisms. Inadequate intake of these foods along with poor dietary habits, may affect the mental health. Thus, adequate consumption of probiotics and prebiotics is an important component to a balanced diet which supports overall mental well-being.

Role of Probiotics and Prebiotics in Mental Health
Role of probiotics and prebiotics in mental health is influenced by several factors including genetics, environment, lifestyle, and dietary habits. Among these nutritional approaches, probiotics and prebiotics have gained considerable attention because of their potential influence on mental health outcomes through regulation of intestinal microbial activity. Foods which are rich in prebiotic may support psychological health by promoting growth of beneficial intestinal microorganisms. Increased intake of fruits, Vegetables, whole grains, and other prebiotic-containing foods have been associated with improvements in mood, reduced psychological distress, and lower anxiety severity.

Dietary Consumption Patterns and Mental Well-Being
Dietary patterns, particularly the consumption of probiotics and prebiotics foods may influence mental well-being by supporting beneficial gut microorganisms and maintaining intestinal balance. Regular intake may contribute to neurotransmitter production stress regulation, and inflammatory responses, thereby supporting mood and reducing anxiety. In contrast, high consumption of ultra-processed foods, refined sugars, and saturated fats, along with low dietary fibre, may negatively affect gut and associated with mood and anxiety disorders.

Impact of Consumption of Probiotics and Prebiotics on Mental Health (Anxiety, Depression and Stress)
Probiotics and Prebiotics which play a potential role in supporting psychological health. Probiotic strains such as Lactobacillus and Bifidobacterium may influence neurotransmitter activity, immune responses, and stress which contribute to improvements in anxiety, depressive symptoms and psychological distress. Probiotics may also affect serotonin and dopamine metabolism and help to regulate inflammatory responses associated with mood disorders.
Prebiotics which support the growth of beneficial microorganisms and increase the production of short-chain fatty acids, which may influence emotional and cognitive

functions. The consumption has been associated with improved stress regulation, reduced anxiety symptoms. Unlike probiotics, prebiotics do not contain live microorganisms; rather they promote beneficial microbial growth.

Materials and Methods

A quantitative cross-sectional correlational study was conducted among (N=100) college students at Veeranari Chakali Ilamma Women's University. Participants with relevant medical conditions, diagnosed psychiatric disorders, chronic gastrointestinal diseases, or incomplete responses were excluded.

Data Collection and assessment tools

Data were collected using a structured questionnaire consisting of demographic details, probiotic and prebiotic consumption assessment, dietary consumption patterns and mental health assessment. Mental health questionnaire was assessed using separate standardized scales of stress, anxiety, and depression. The questionnaire was also included in food frequency assessment to determine the frequency of consumption of probiotic and prebiotic rich foods.

Mental Health Questionnaire Scales

Stress Assessment (Perceived Stress Scale –PSS-10)
Anxiety Assessment (Generalized Anxiety Disorder Scale – GAD –7)
Depression Assessment (Patient Health Questionnarie-PHQ-9)

Scoring

Mental Health Assessment: Mental health was assessed using three standardized instruments: Perceived Stress Scale –PSS-10: Consists of 10 items scored from 0 (never) - 4 (very often), with positively worded items reverse scored. The total ranges from 0-40.
Generalized Anxiety Disorder Scale –GAD –7: Which consists of seven items assessing anxiety were scored from 0 (not at all) to 3 (nearly every day), giving a total score of 0-21. Depressive symptoms were assessed using the PHQ-9, comprising nine items scored from 0-3, with a total score ranging from 0-27. Were GAD -7 and PHQ – 9 consist of 7 and 9 items, respectively, with responses scored to 0-3. Scores were summed to obtain the respective total scores, which were subsequently classified into symptom-severity categories according to the scoring criteria used in the study.

Statistical Analysis

Data were analysed using JASP statistical software. Descriptive statistics, including frequencies and percentages, were used to summarize the participant's characteristics and mental health categories. Spearman's rank correlation was used to assess the association between probiotic and prebiotic consumption scores and mental health. Statistical significances were defined as $p < 0.05$.

Ethical consideration

Participation in the study was voluntary. Before administering the questionnaire, participants were about the study. Informed consent as obtained from all the participants prior to data collection and signatures were taken at the end of the questionarrie. Confidentiality of the participant's information was ensured throughout the study, and the collected data were used exclusively for academic research.

Results and Discussion

A total of 100 participants were included in the study. The participants were young adults aged 17-25. years. The largest proportion belonged to the 20–22 year age group (44%), followed by the participants aged 23-25 years (39%) and 17-19 years (17%). Educational qualification, 75% of participants were pursuing a master's degree, while 25% had a bachelor's degree.
Based on BMI classification, 56% of participants had a normal BMI, while 35% were underweight, 6% were overweight, and 3% were obese. Regarding meal patterns, breakfast was the most frequently reported meal (46%), followed by mid-morning meals (33%), lunch (15%), and dinner (6%). For late-night food consumption,46% reported consuming food occasionally, 26% weekly, 18% monthly, and 10% never. Overall, the participants were predominantly young adults pursuing postgraduate education, with normal BMI being the most common and occasional late-night food consumption being commonly reported.

Table 1: Participant Characteristics and Dietary Patterns (N=100)

Variable	Category	Frequency(n)	Percentage (%)
Most frequently consumed meal	Breakfast	46	46
	Mid-morning	33	33
	Lunch	15	15
	Dinner	6	6
	Total	100	100
Late-night food consumption	Occasionally	46	46
	Weekly	26	26
	Monthly	18	18
	Never	10	10
	Total	100	100
Digestive discomfort frequency	Weekly	53	53
	Rare	22	22
	Daily	20	20
	Never	5	5
	Total	100	100

Table 2: Distribution of Participants According to Mental Health Status (N=100)

Assessment	Category	Frequency(n)	Percentage (%)
Stress (PSS-10)	Low	4	4%
	Moderate	89	89%
	High	7	7%
	Total	100	100%
Anxiety (GAD-7)	Minimal	19	19%
	Mild	44	44%
	Moderate	28	28%
	Severe	9	9%
	Total	100	100%
Depression(PHQ-9)	Minimal	10	10%
	Mild	49	49%
	Moderate	24	24%
	Moderately severe	15	15%
	Severe	2	2%
	Total	100	100%

Overview of Mental Health Participants

Mental health status was assessed using the PSS-10, GAD-7,and PHQ-9 scales. It was observed that most participants had moderate stress (89%), while mild anxiety (44%) and mild depression (49%) were the most common categories. Moderate anxiety (28%) and moderate depression (24%) were also observed, whereas severe anxiety (9%) and severe depression (2%) were less common. Overall, it indicates that majority of participants were moderate stress with mild anxiety and depressive symptoms.

Association of Probiotic and Prebiotics Consumption Score with Mental Health using Spearman's Rank Correlation

Correlation Analysis between the Variables (N=100)

Association (Mental Health Score)	Spearman's rho	P-value	Interpretation
Probiotic Consumption Score	-0.09097	0.368	Very weak negative relationship
Prebiotic Consumption Score	-0.1362	0.177	Weak negative relationship

Spearman's Rank Correlation was performed to assess the association between probiotic and prebiotic consumption scores and mental health scores among the participants (N=100). A very weak negative correlation was observed between probiotic consumption score and mental health score (rho = -0.09097, p = 0.368), while a negative correlation was found between prebiotic consumption score and mental health (rho = -0.1362, p = 0.177). However, both associations were not statistically significant (P > 0.05). These indicates that probiotic and prebiotic consumption were not significantly associated with mental health scores among the participants. The lack of significance may be attributed to the cross- sectional study design, limited dietary variation, and the other life style factors on mental health.

Conclusion

The present study concluded that there was no statistically significant association between probiotic and orebiotic consumption and mental health scores among young adults. Although weak negative correlations were observed, indicating that probiotic and prebiotic intake alone may not have a measurable influence on mental health in the study population. Mental health is influenced my multiple factors including dietary habits, lifestyle, environmental and psychological factors, which may be contributed to the observed findings.

Funding: No external funding was received for this study.

Conflict of Interest: The authors declare no conflict of interest.

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