ISSN: 2320-9267

Indian Journal of Pharmaceutical and Biological Research (IJPBR)

Journal homepage: www.ijpbr.in

RESEARCH ARTICLE

The Food–Mood Connection: Exploring the Bidirectional Relationship Between Nutrition and Mental Health

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ABSTRACT

Mental health disorders, particularly depression and anxiety, have become major public health concerns worldwide, increasing the need for effective and accessible preventive strategies. Among the various lifestyle factors that influence psychological well-being, diet has gained considerable attention because it is both modifiable and closely linked to brain function. This review examines the food–mood connection, highlighting the dynamic and reciprocal relationship between dietary habits and emotional health. While emotions can influence appetite, food preferences, and eating behaviour, the foods people consume also affect mood through a range of biological and psychological mechanisms. The review discusses the influence of food colour, nostalgic food experiences, cultural dietary patterns, and food cravings on emotional well-being and food choices. It also explores the biological pathways that underpin this relationship, including the gut–brain axis, neurotransmitter regulation, chronic low-grade inflammation, and the role of essential nutrients in maintaining normal brain function. Current evidence indicates that dietary patterns rich in fruits, vegetables, whole grains, legumes, fermented foods, and healthy fats support gut microbial balance, reduce inflammation, and promote positive mental health. In contrast, frequent consumption of ultra-processed foods has been associated with impaired gut health and an increased risk of mood disorders. Overall, the available evidence suggests that nutrition should be recognised as an important component of mental health promotion, with healthy dietary practices serving as a practical and cost-effective complement to conventional approaches for improving emotional well-being.

Keywords: Food–mood connection, Nutritional psychiatry, Gut–brain axis, Dietary patterns, Neurotransmitters, Mental health.

Indian J. Pharm. Biol. Res. (2026): https://doi.org/10.30750/ijpbr.14.3.32

Introduction

People at all walks of life and age groups are affected by cognitive and emotional health which has become one of the most concerned global public health issues. Anxiety and depression report to be the main causes of disability, low quality of life, reduced cognitive function, low productivity and also high health care costs. Also, what is of great study interest to researchers is the role of modifiable lifestyle factors which they think may improve mental wellbeing as these disorders' prevalence grows.

In the past genetic, psychological and environmental factors which include long term stress, traumatic events, physical inactivity, insufficient sleep, and social economic issues were put forth to account for mental health [1]. However, we see an increase in research which reports that role of nutrition in mental and emotional well-being. Food security and psychological health are very much at play in each other and this is put forth by a range of factors which include socio economic status, access to healthy food, and social injustices [2]. The reciprocal association between diet and emotional health is known as the "food–mood connection." While emotional states impact hunger, food preferences, and eating behaviors, food influences mood through a variety of biological and psychological pathways. Consumption of highly processed, energy-dense foods heavy in sugar, refined carbs, saturated fats, and salt is frequently encouraged by stress, anxiety, sadness, and loneliness. While these foods can temporarily improve mood by activating the brain's reward pathways, habitual long-term consumption is associated with increased

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How to cite this article: Dugar A. The Food–Mood Connection: Exploring the Bidirectional Relationship Between Nutrition and Mental Health. Indian J. Pharm. Biol. Res. 2026;14(3):194-205.

Source of support: Nil

Conflict of interest: None.

Received: 23/06/2026 **Revised:** 03/07/2026 **Accepted:** 22/07/2026 **Published:** 29/07/2026

inflammation, metabolic disturbances, and an elevated risk of adverse mental health outcomes [3].

Inadequate dietary habits contribute significantly to the growing burden of mental health disorders, while a balanced diet promotes positive mood and better cognitive performance[4]. The intestinal brain axis, which connects the brain and the microbes in the gastrointestinal tract, has recently attracted attention as a possible tractable target to regulate brain health. Dietary factors have a significant impact on the gut microbiota's makeup and activity, which can change gut-brain signalling. Researchers describe significant diet related impacts on the gut microbial system for the onset, maintenance, and promotion of neuropsychiatric health. The diet-microbiota-gut-brain nexus is an unexplored area for lifelong brain health diagnosis and treatment [5]. There is disagreement over the effectiveness of probiotics and supplements on mood outcomes. To completely comprehend the pathways linking food, gut microbiota, and mental health, more research is required. Overall results point to the viability and benefits of dietary changes for mild cases of sadness and anxiety [6].

When the brain's key functional networks, including the salience, central executive, and default mode networks, become disrupted, the ability to regulate eating behaviour is weakened, often resulting in impulsive or excessive eating. Although growing evidence suggests that physical activity benefits both the gut microbiota and brain connectivity, findings from studies remain inconsistent, particularly regarding the timing of these changes and their causal relationships [7].

Current studies report that the issue of nutrition in relation to mental health is much wider than we previously thought. In the past we saw mainly what we put in terms of nutrients as what was important but we are now looking at what we don't see the role of the brain in all of this. Also, we have seen that diet plays a role in very complex ways in the function of the brain. For instance, we see that what we eat affects neurotransmitter production, inflammatory responses, what goes on with oxidative stress, neuroplasticity and hormonal balance which in turn play a great role in how we feel emotionally and do in fact affect our psychological health. We also put into our bodies via our diet prebiotics that become fuel for our gut microbial community the gut microbiome. Diet plays a fundamental role in shaping the configuration, variety and performance of the gut microbiome. In turn, the gut microbiome works closely with the intestinal lining and the mucosal immune system to maintain intestinal homeostasis. Disruptions in this microbial balance have been associated with the development of numerous diseases [8]. Together, these findings have established nutrition as a modifiable factor in maintaining brain health and supporting mental wellness, providing a strong scientific foundation for understanding the relationship between food and psychological wellbeing.

This review thoroughly considers the connection between food and mood from two key perspectives: food-related factors and biological mechanisms. The food related factors are: Food colour psychology, Food memory and Nostalgia, Indian vs. Western diet, Food craving as a gauge to emotional state. Furthermore, the review investigates the underlying biological mechanisms that link the food–mood relationship, such as the digestive tract, food-mediated regulation of neurotransmitters, role of inflammation in mood disorders and food–mood regulation association with nutrients. When considered as a whole, these factors paint a picture of the impact of food on emotional and mental health.

Concept of Food–Mood Connection

It is a dynamic and reciprocal link between mood and food, creating a feedback loop between emotional state and food selection, food intake and physiological and psychological reactions, and these reactions and their effects changing the emotional state. This cycle can maintain healthy eating habits and emotional health or lead to unhealthy eating and mental health.

Mood is a major factor in choice of food. Overall, positive emotional states are linked to better food choices such as eating whole, minimally processed foods rich in essential nutrients [9]. On the other hand, negative emotions like emotional strain, anxiety, low mood, monotony, social disconnection and anger tend to encourage emotional eating and this involves eating more of very desirable foods with a high sugar, saturated fat and refined carbohydrate content. These foods stimulate the neural pleasure centres, which causes the release of dopamine, providing temporary comfort and enjoyment [10].

The science of this relationship is called nutritional psychology, and is a new field that finds the links between food and the prevention, development and treatment of mental diseases like and cognitive dysfunction. There are a number of biological reasons for the food-mood connection [11].

In past few years, studies have highlighted the importance of the overall quality of the diet and eating habits over the course of many years in determining mental health, a factor that goes beyond any single nutrient. Therefore, diet has emerged as an additional strategy to conventional

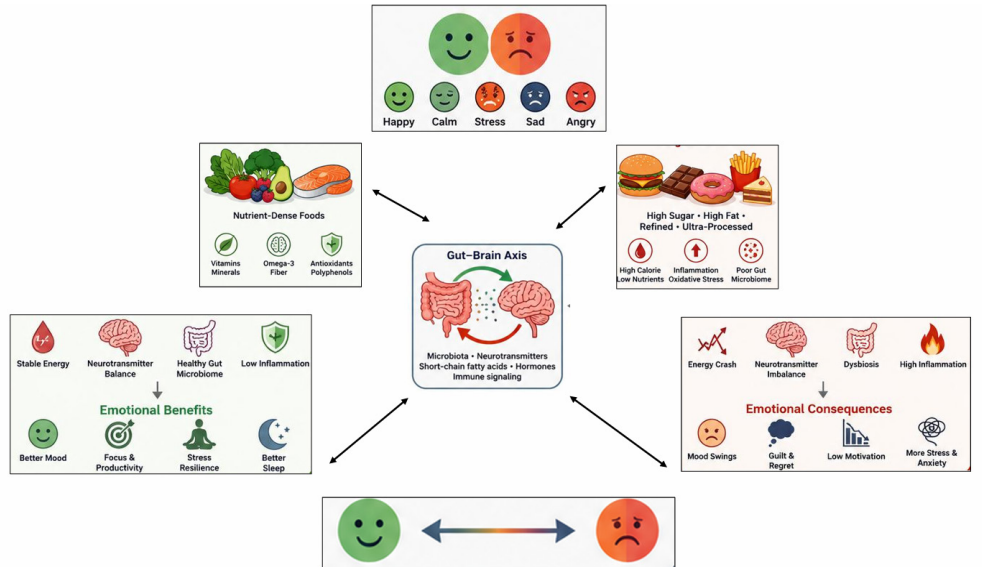


Fig. 1: Food choices by emotional state

psychological and pharmacological treatments to address mental health problems is gaining traction [12,13,14]. Thus, the food–mood relationship is a holistic perspective that connects the interplay of nutrition, metabolism, the gut microbiome, immune regulation and brain function, explaining how the choices of daily nutrition impacts emotional health across the lifespan.

Eating healthy foods can help to maintain a steady energy level, improve concentration, balance emotions, and boost cognitive function. Conversely, regular eating of high-energy, low-nutrient foods is often associated with pleasure and subsequent feelings of fatigue, guilt, loss of motivation, mood swings and food cravings. The negative emotional experiences can lead to continued emotional eating, creating a vicious cycle of negative emotions and eating.

As shown in Figure 1.1, emotions have an impact on food choice, and food intake in turn can have an impact on psychological wellbeing through several biological pathways. Positive moods tend to be linked to the intake of nutrient-rich foods that contain high levels of vitamins and minerals, dietary fibre, omega-3 fatty acids, antioxidants, and polyphenols; these foods support the maintenance of a healthy gut microbiota, stimulate production of neurotransmitters, decrease systemic inflammation and metabolic imbalance [11]. These physiological changes include better mood, more emotional resilience, better cognitive functioning, and better sleep. Negative emotions, like stress, anxiety, and sadness, on the other hand, tend to boost the craving for the ultra-processed products that are high in refined sugars and saturated fats. All the above-mentioned dietary practices lead to gut microbial dysbiosis, oxidative stress, chronic low-grade inflammation, and neurotransmitter imbalance, causing mood instability, decrease in motivation, anxiety, and the risk of depressive symptoms [8]. The food–mood connection is a fundamental function of the gut–brain axis and taking a healthy approach to nutrition can be crucial for psychological health.

Food-Related Factors Influencing Mood and Emotional Well-Being

Colour Psychology of Food and Its Influence on Mood

The visual appearance of food is one of the earliest sensory cues influencing food selection, appetite, and emotional responses. Before taste or aroma is perceived, the brain evaluates the colour of the food, forming expectations about its freshness, flavour, safety, and nutritional value.

The colour of food plays a key role in shaping perceptions of its freshness, edibility, and nutritional value [15]. In nature, the colour red is frequently seen in foods, particularly in ripe fruits and freshly prepared meat, making it a familiar visual cue. Blue coloured foods are uncommon in nature, and this colour is occasionally linked to reduced edibility because it is associated with fungus and food spoilage. As a result, red is commonly associated with increased appetite, while blue is often regarded as a colour that suppresses appetite [16].

Despite these widely held beliefs, studies exploring the effects of red and blue on appetite have produced

inconsistent and sometimes contradictory findings. Combining selected food colors with complementary colour cues has the potential to influence consumers' willingness to consume sweet products [17]. Latest studies show sweetness is commonly linked with red and pink hues. Sour taste is commonly associated with green and yellow colours, while salty foods are often linked to yellow and blue. Bitter flavours are typically connected with green, brown, and orange shades, whereas umami is generally represented by brown and deep red tones.. These associations are reinforced by familiar foods such as fruits, candies, citrus, vegetables, chocolate, mushrooms, and meat. Additionally, fruit ripeness alters both colour and taste perception, with ripe fruits perceived as sweeter and more preferred, while unripe fruits are associated with greater sourness and bitterness. Overall, colour and food familiarity play a significant role in making taste expectations and food preferences [18].

Differences in colour lightness influence taste perception, with lighter reddish hues typically associated with sweetness and darker greenish hues more frequently perceived as sour or bitter [19]. Studies further suggest that red is strongly associated with spiciness, demonstrating that colour flavour relationships extend beyond taste alone to include other sensory components, such as trigeminal stimulation, which contributes to the perception of pungency and heat. [20]. Some studies suggests that people naturally connect round shapes with sweet tastes, whereas sharp or angular shapes are typically associated with sour, salty, and bitter flavour. [21].

Colour is a key element in gastronomy for the visual appeal of cuisines and preparations. The way food is arranged and presented on a plate is visually evaluated by the consumer and this is a very important aspect of food presentation, which has been described as eating with the eyes [22,23]. In Fig. 2, according to Schifferstein plating is the creative process of arranging food on a plate, forming the consumer's first visual interaction with the meal. [23]. The colours used in plated food play an important role in shaping emotional responses. It also confirmed that colour is a key sensory attribute in gastronomy, influencing both the dining experience and consumers' acceptance of a dish. The results are consistent with the previous literature for red and yellow, as their symbolic connotations were similar both in edible and non-edible settings [22]. Combined, these results show that the color plating is not only an presentation issue, but also an emotional one and one of hedonic acceptance, thus proving the importance of sensory elements that shape the eating experience [24].

Foods with warm colours tend to signal an increase in appetite, excitement, energy, and positive affect. These colours are arousing and could increase the reward response to food through the action of dopamine. Green coloured foods are more likely to be seen as healthy, fresh and natural, while green is considered more calming and soothing for the mind. Foods with blue colour are comparatively rare in nature and are generally not palatable or edible because of evolutionary links with food spoilage or toxicity. Emotional satisfaction and familiarity is often the result of white and brown food items, which can lead to perceptions of purity, simplicity and comfort [23,24].

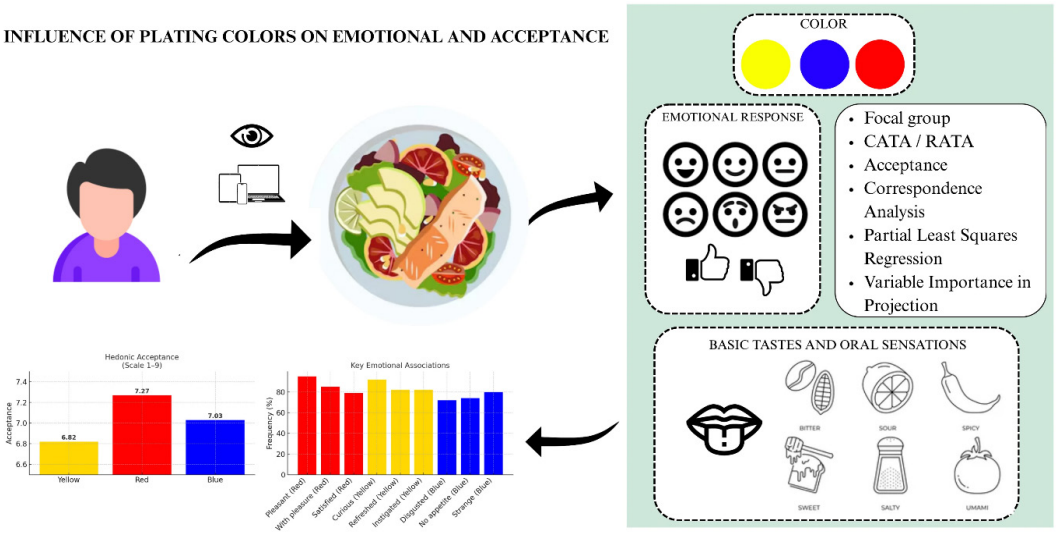


Fig. 2: Effect of plating colours on emotional acceptance

Food Memories, Nostalgia, and Emotional Well-Being

Food possesses a unique ability to evoke autobiographical memories and emotional experiences. The concept of food nostalgia refers to the emotional attachment individuals develop toward foods associated with childhood, family traditions, cultural celebrations, and significant life events. The formation and emotional significance of these memories are largely governed by the hippocampus and amygdala, which are key regions involved in memory and emotion.

Simpson and Angus reported that food-evoked nostalgia has a multifaceted influence on emotional well-being. Foods associated with nostalgia often trigger a mixture of positive and bittersweet emotions. By recalling shared experiences and personal memories, they strengthen social connections and identity while promoting emotional comfort, familiarity, and improved mood [25].

Nostalgia has been connected with several positive health outcomes, including enhanced emotional well-being, stronger social connections, and improved quality of life. However, nostalgic experiences are often elicited by negative emotional states, particularly feelings of loneliness, isolation, or meaninglessness [26]. Rather than reinforcing negative emotions, nostalgia often helps improve mood by offsetting feelings of distress. Evidence suggests that nostalgic experiences contribute to both immediate and lasting psychological wellbeing by enhancing positive emotions and strengthening one's sense of meaning in life [27]. People often turn to comfort foods when experiencing nostalgia, and these foods are believed to have a positive effect on mood. The interconnected relationship among nostalgia, food, and emotional health suggests that this phenomenon could be used to develop strategies aimed at improving well-being and promoting healthier lifestyles [28,29,30].

Indian and Western Dietary Patterns

Food availability, the kind of food eaten, how it is prepared and how it is eaten are greatly shaped by cultural food practices, which in turn affects its relationship with mood. There are significant variations in traditional diets and their associated intake of nutrients and mental health outcomes between populations.

The traditional Indian diet is characterized by abundant consumption of whole grains, pulses, legumes, seasonal vegetables, fruits, fermented dairy products, nuts, and a wide variety of spices such as turmeric, ginger, cumin, coriander, and cinnamon. Many of these foods help protect the body from oxidative stress and inflammation while encouraging a balanced and diverse gut microbiome [31]. Fermented foods such as curd and buttermilk provide probiotics that support gut–brain communication, while spices like turmeric contain curcumin, which has demonstrated neuroprotective and antidepressant potential in several clinical studies. Evidence indicates that functional foods can help prevention and treatment of mental health disorders through multiple mechanisms, including reducing oxidative stress and inflammation, maintaining healthy mitochondrial function, and preventing the accumulation

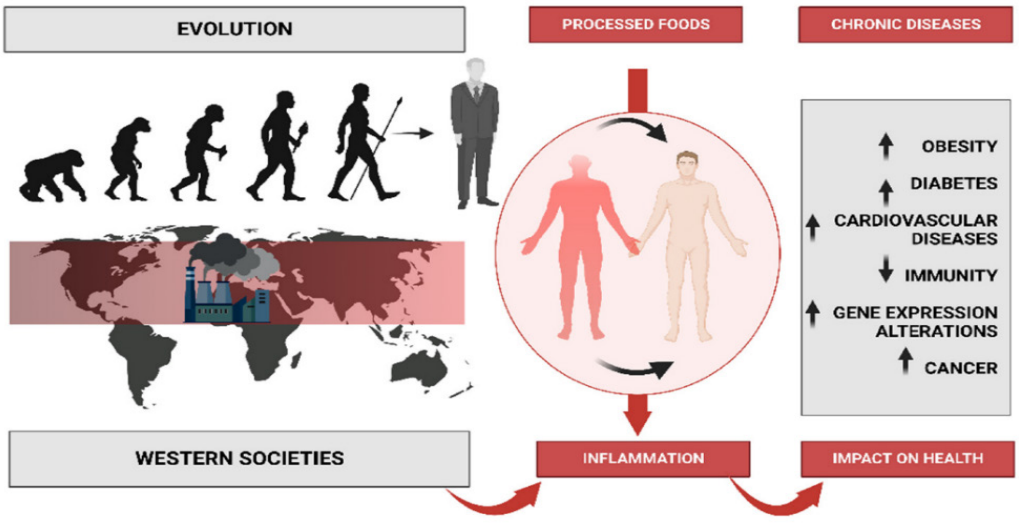


Fig. 3: Dietary patterns and their impact on human body

of abnormal protein aggregates. Incorporating these foods into regular diets may support mental health, while their bioactive compounds also hold potential for the development of nutraceuticals and medications for psychiatric conditions [32].

On the other hand, the western style diet is generally marked by higher consumption of ultra-processed foods, refined carbohydrates, sugary beverages, processed meats, saturated fats, and energy-dense snacks. These dietary habits are associated with increased systemic inflammation, oxidative stress, gut microbiota dysbiosis, insulin resistance, and higher chance of depression and psychological distress. Fig.3. explains that implementation to Mediterranean or traditional dietary patterns is in relation to better mental health compared with Western-style diets [33].

Diets high in ultra-processed, refined, and sugary foods are associated with reduced emotional well-being and an increased prevalence of mood disorders. At the same time, people with depressive symptoms often tend to choose these foods over healthier, fresh alternatives, suggesting a bidirectional relationship between diet and mental health [34,35,36]. Furthermore, the higher cost and limited availability of whole, nutritious foods can pose significant barriers for people experiencing low mood, often leading to less healthy dietary choices. A study found that people experiencing depressive symptoms generally exhibited lower diet quality scores, suggesting a reduced adherence to healthy eating patterns [37], while few reported that poorer diet quality is associated with a higher occurrence of depressive symptoms. [27].

Similarly, focus group participants showed that they tended to consume less healthy foods during periods of low mood. They also believed that these dietary choices negatively affected their emotional well-being, emphasizing that mood both influences and is influenced by food choices [27]. Globalization has increasingly blurred these dietary distinctions, with many developing countries adopting Western dietary habits. This nutritional transition may partially explain the growing prevalence of mood disorders alongside obesity and metabolic diseases, emphasizing the importance of culturally appropriate healthy dietary interventions.

Food Cravings as Indicators of Emotional and Psychological States

Food cravings are a strong urge to eat certain foods and are the result of complex interplay between neurobiological, hormonal, psychological, and environmental factors. Cravings are not necessarily just a result of hunger, but often occur as a result of emotional states like stress, anxiety, boredom, loneliness, or depression [38].

Unpleasant emotions often trigger cravings for foods that are high in sugar, fat, and refined carbohydrates. These foods activate the dopamine reward system, resulting in short-term happiness due to increased dopamine levels. Serotonin deficiency is also suggested to drive up carbohydrate cravings by the effect of carbohydrates on the blood–brain barrier for tryptophan transport, which leads to more serotonin production.

When the body is stressed, it stimulates the hypothalamic pituitary adrenal (HPA) axis, leading to higher levels of cortisol in the bloodstream which boosts appetite and the desire for high energy foods. Relatedly, human research has identified multiple changes in the intestinal microbiome axis among individuals with Ultra Processed Food addiction. Regular overconsumption of ultra-processed foods in people with UPF addiction may disrupt dopamine-mediated reward pathways, enhancing cravings for these foods. In addition, it can interfere with the hormones that regulate hunger and satiety, resulting in increased appetite and reduced fullness, while also altering the gut microbiome in ways that may promote obesity [39]. Additionally, appetite-regulating hormones including ghrelin and leptin interact with reward circuits, influencing both hunger and emotional eating behaviour. Sleep deprivation further amplifies food cravings by altering these hormonal pathways and increasing neural responsiveness to rewarding food stimuli [40]. A study of 682 university students found that individuals following low-carbohydrate (LC) diets showed greater tendencies toward binge eating, food cravings, and conscious restriction of food intake than non-dieters.. These effects were further amplified when LC diets were combined with intermittent fasting (IF), suggesting that restrictive dietary practices may increase food cravings and the risk of disordered eating behaviours [41]. A review found that binge-eating disorder (BED) is mainly associated with recurrent binge eating and body weight concerns, whereas food addiction (FA) is characterized by persistent food cravings, loss of control, and addiction-like eating behaviors [42].

Biological Mechanisms Linking Food and Mood

Gut–Brain Axis

Diet strongly shapes the gut microbial system, influencing its performance and modulating communication along the gut–brain axis [5]. The gastrointestinal tract and the central nervous system are linked through the gut–brain axis. This system enables continuous exchange of signals through neural, endocrine, immune, and metabolic mechanisms.

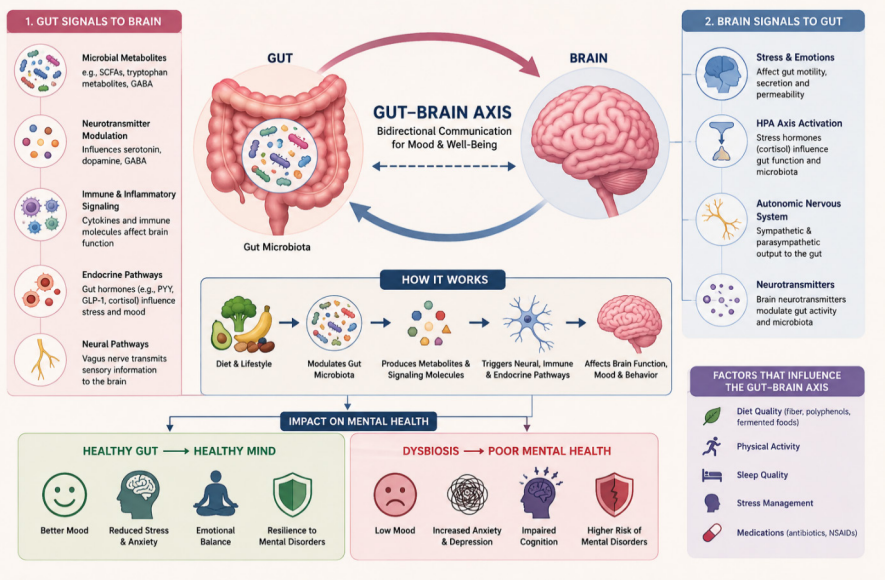


Fig. 4: Bidirectional relation between Gut and Brain axis

This complex system involves the vague nerve, HPA axis, enteric nervous system, immune mediators, and the gut microbiota. Increasing evidence shows that changes in gut microbial composition (dysbiosis) can influence cognitive function, emotional regulation and susceptibility to common mental disorders (CMDs), including depression and anxiety [43]. Fig. 4. shows the bidirectional relation between Gut and Brain axis.

Dietary habits strongly influence the intestinal microbiome. Diets rich in dietary fiber, fermented foods, fruits, vegetables, legumes, and polyphenols support microbial diversity and increase the production of metabolites [6]. Western diets, however, that are rich in saturated fats, refined sugars and UPFs have been linked to lower microbial diversity and promote inflammation. Therefore, dietary regulation of the gut microbiota by dietary fibre, probiotics, and symbiotic has become a promising approach to enhance mental health [44]. The gut microbiota also generates neurotransmitters and neuroactive compounds that regulate mood, such as serotonin, dopamine, gamma-aminobutyric acid (GABA), and short-chain fatty acids (SCFAs) like acetate, propionate and butyrate. Serotonin is synthesized in the gut tract and is present in the enteric nervous system. The majority of the body's serotonin, estimated at 90–95%, is produced in the gut, which plays a role in regulating gut motility and indirectly, central nervous system function [45]. It helps to maintain intestinal barrier integrity, reduce systemic inflammation, and modulate immune signalling that can affect brain function. On the other hand, gut microbial imbalance can damage the intestinal barrier, making it more permeable and allowing bacterial toxins such as lipopolysaccharides (LPS) to leak into the bloodstream, triggering inflammatory responses that have been associated with depressive symptoms and impaired cognition [46,47,48]. The gut and the mind are closely linked as shown in Fig. 5. An optimal intestinal flora has a positive effect on the mental health, on the reduction of stress and anxiety, on emotional balance and on the resistance to mental diseases. By contrast, unhealthy gut (dysbiosis) is linked to reduced mood, heightened worry and depression, and poor cognitive function, and increased risk of mental health disorders. In general, a healthy gut may be associated with a healthy mind, as dietary habits have a significant impact on gut health.

Neurotransmitters and Mood Regulation

Neurotransmitters are crucial in the function of the brain and are essential in comprehending the biochemical underpinning of mental health. The link between neurotransmitter activity and psychological disorders, which will examine how the balance of these chemical messengers can lead to conditions like schizophrenia, bipolar disorder and more. Research discussed the role of key neurotransmitters in mood regulation, cognition and behaviour, such as serotonin, dopamine, norepinephrine,

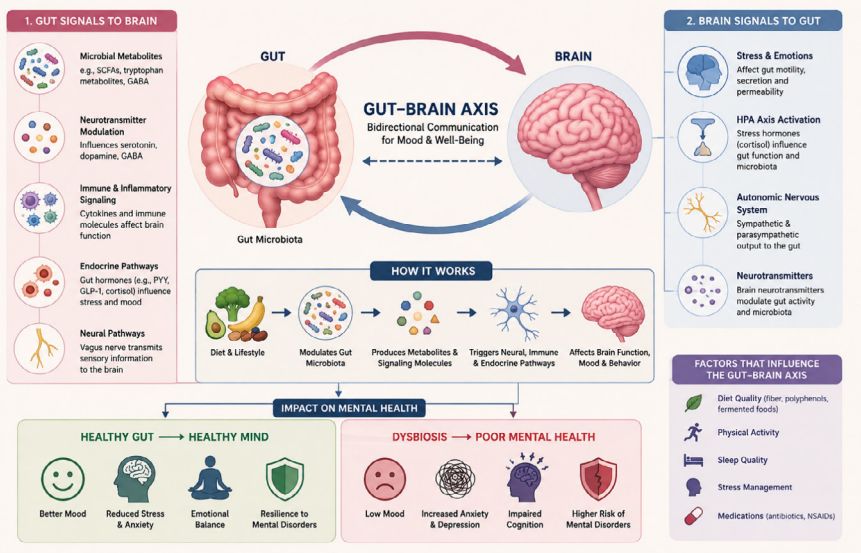


Fig. 5: Gut health and mental well-being relation

gamma-aminobutyric acid (GABA) and glutamate [49]. Fig.6. shows what neurotransmitters are and how they work with food to regulate mood.

The serotonin system is a well-documented system associated with mood disorders. It controls emotional stability, sleep, appetite and social behaviour. The amino acid, tryptophan, in the diet is important for the synthesis of serotonin, and foods high in protein, especially those from the dairy, egg, fish, poultry, soybeans, nuts, and seeds provide this [50,51]. Carbohydrate supplementation helps to promote the movement of tryptophan to the brain via the blood–brain barrier and thus improves serotonin levels. Serotonin (5-HT) is produced, primarily by the enterochromaffin cells, and by some microbial species. Tryptophan (TRP) is the only precursor of 5-HT (more than 90% of TRP in the diet is degraded by the major kynurenine (KYN) pathway [52]). Dopamine is a neurotransmitter that is vital in regulating reward, pleasure, motivation, attention, and learning. It is produced from the amino acid tyrosine, which is naturally found in protein rich foods such as dairy products, legumes, meat, fish, and soy products. Reduced dopamine signalling has been linked to low motivation, loss of pleasure (anhedonia), and depression. Consuming dopamine-supporting foods such as fish, eggs, and spirulina may help maintain healthy dopamine levels, which can contribute to better sleep, improved concentration and

NEUROTRANSMITTERS AND THEIR ROLE IN MOOD REGULATION BY FOOD

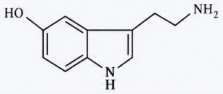
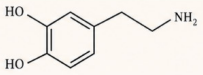
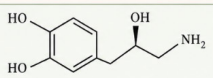
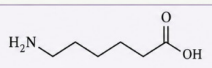
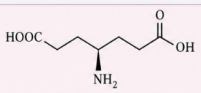
NEUROTRANSMITTER	MOLECULAR STRUCTURE	ROLE IN MOOD REGULATION
SEROTONIN (5-HT)		• Regulates mood and promotes feelings of well-being. • Involved in sleep regulation and reduction of anxiety.
DOPAMINE (DA)		• Mediates reward, motivation, and pleasure. • Supports goal-directed behavior and positive mood.
NOREPINEPHRINE (NE)		• Enhances alertness, attention, and stress response. • Regulates arousal and mood stability.
GAMMA-AMINOBUTYRIC ACID (GABA)		• Acts as the primary inhibitory neurotransmitter, promoting relaxation. • Reduces anxiety and supports restful sleep.
GLUTAMATE (Glu)		• Major excitatory neurotransmitter involved in learning and memory. • Regulates synaptic plasticity and cognitive function.

Fig. 6: Role of neurotransmitters in mood regulation

memory, and overall emotional well-being [53,54]. GABA helps to promote relaxation and reduce anxiety by limiting excessive nerve cell activity. Certain fermented foods and probiotics may support GABA production by interacting with the gut microbiota, thereby contributing to improved emotional balance and mental well-being. Neurotransmitters, such as norepinephrine, glutamate and acetylcholine, also regulate cognitive functioning and emotional control. Vitamin B6, B12, folate, magnesium, iron, zinc, and omega-3 fatty acids are essential for synthesizing neurotransmitters and the function of neurons, making them more susceptible to mood disorders.

Inflammation and Mood Disorders

Inflammation is the biological mechanism which links dietary habits with mental health. Persistent inflammation impacts brain function by activating immune pathways, altering neurotransmitter metabolism, disrupting neuroplasticity, and impairing communication between the digestive system and brain [55].

Individuals with mood disorders frequently exhibit higher circulating concentrations of inflammatory biomarkers such as C-reactive protein (CRP), interleukin-6 (IL-6), interleukin-1β (IL-1β), and tumour necrosis factor-alpha (TNF-α). These cytokines cross the blood–brain barrier, stimulating microglial activation and neuroinflammation. During inflammation, tryptophan is increasingly converted through the kynurenine pathway instead of being used for serotonin synthesis. This lowers serotonin levels and produces neurotoxic by-products that may promote depressive symptoms [56]. Carotenoids, due to their antioxidant and anti-inflammatory properties, may help protect against depression and support mental well-being, highlighting the efficiency of dietary interventions in promoting mental health [57].

Inflammation plays a significant role in the biological changes associated with mood disorders. People affected by major depressive disorder (MDD) frequently display increased concentrations of inflammatory cytokines in their circulation, suggesting the involvement of inflammatory processes in the condition, with particularly high concentrations observed in patients who do not respond to conventional treatments [58]. Psychological stress can trigger inflammatory responses similar to those observed during injury or illness by activating immune cells such as monocytes, lymphocytes, and mast cells. These inflammatory signals can travel from the peripheral immune system to the brain, influencing regions involved in emotion regulation. Consequently, understanding stress-induced inflammatory pathways is essential for explaining the development of mood and anxiety disorders [51]. Pro-inflammatory cytokines and endotoxins have been shown to induce behavioural alterations resembling symptoms of depression, anxiety, and PTSD. Characterizing cytokine profiles associated with stress-related behaviours may provide valuable insights into biomarkers and therapeutic targets for mood disorders. Dysregulated peripheral and central immune activation can influence limbic brain function, contributing to emotional disturbances.

Food involvement shapes dietary behaviour by influencing food choices based on sensory and emotional factors. Meanwhile, higher health engagement is associated with better psychological well-being, increased dietary satisfaction, and improved quality of life. Evaluating dietary patterns and patient perceptions may assist in developing personalized nutritional interventions for effective disease management [59].

Nutrients and Mood

Adequate intake of essential nutrients is critical for optimal brain development, neurotransmitter synthesis, energy metabolism, and neuroprotection. Nutritional deficiencies impair cognitive function and elevate the risk of low mood, and other psychiatric disorders. Research indicates that specific nutrients play a significant role in preventing and treating it particularly through the regulation of neurobiological mechanisms. Maintaining optimal brain function and emotional health depends partly on the availability of key nutrients, such as omega-3 fatty acids, vitamin D, B vitamins, minerals, and antioxidants, which help regulate inflammation and support neurotransmitter activity [60]. Omega-3 polyunsaturated fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), support neuronal membrane fluidity, reduce neuroinflammation, and enhance neurotransmission [60].

B-complex vitamins, including folate, vitamin B6, and vitamin B12, participate in one-carbon metabolism and neurotransmitter synthesis [60]. Deficiencies in these vitamins elevate homocysteine concentrations, which have been linked to cognitive decline. Vitamin D functions as a neurosteroid hormone involved in neuroimmune regulation and neuronal growth. Low serum vitamin D concentrations have been associated with increased prevalence of depression, although supplementation studies show mixed findings [61]. Minerals such as Mg, Zn, Se and Fe also contribute significantly to mental health. Magnesium regulates receptor activity and stress responses, zinc

supports synaptic plasticity and immune function, selenium acts as an antioxidant, while Fe is essential for oxygen transport and dopamine synthesis [61].

Proteins provide amino acids essential for neurotransmitter production, whereas dietary fibre promotes gut microbial balance and short-chain fatty acid formation. Polyphenol-rich foods, including berries, cocoa, tea, coffee, turmeric, grapes, and leafy greens, may support brain health through antioxidant, anti-inflammatory, and neuroprotective actions.

Conclusion

Studies on the link between food and mood show that this relationship is more elaborate than it used to be thought. In contrast to the previous assumption of a plain, one-way connection, this process is rather dynamic and reciprocal, meaning that food affects one's functioning and wellbeing just like your emotional state influences what you eat. Different factors interact within this process. These can be biological, behavioural, psychological, and sociocultural. In the last few years, the science of nutritional psychiatry has produced several studies showing that different diets can affect a person's feelings, thinking, and overall mental health. Chronic stress, anxiety, and emotional disorders can lead to eating disorders through appetite change and cravings towards high-caloric food, creating a circle of mutual influence of moods and diet. Among the proposed biological mechanisms of this phenomenon, the gut-brain axis has been studied specifically. Evidence is emerging that a diet rich in fruits, vegetables, grains, fermented food, legumes, and healthy fat facilitates bacteria diversity in the intestine, promotes production of neurotransmitters, and minimizes the level of chronic inflammation, which is supposed to improve brain functioning.

The effects of various factors related to foods on emotions and diet are also influenced by a number of biological processes that affect how we perceive foods. These include; food color, sensory aspects (e.g. texture, taste) and how food is prepared culturally, past experiences with food and the emotional relationship we have with food. All of these can impact our perception and response to what we eat. The most common healthy eating patterns, including the Mediterranean Diet and traditional Indian diets, have been shown to be positively correlated with improved mental health through their high concentration of nutrients and anti-inflammatory compounds while many Western style diets have been found to increase the risk for developing mood disorders. While there has been a significant expansion of research in this area it is largely based upon observational data limiting potential causation.

Overall, the accumulated evidence highlights nutrition as a fundamental and modifiable factor influencing mental health. While dietary strategies should complement rather than replace conventional psychiatric treatments, they offer a safe, accessible, and economically feasible approach to promoting emotional well-being and reducing the burden of mood disorders. Advancing research in nutritional psychiatry will further clarify the mechanisms linking diet and mental health, strengthen evidence-based dietary recommendations, and support the incorporation of nutrition into preventive and therapeutic mental health care.

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