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IMPORTANT ROLE OF NUTRITION IN DEPRESSION: A REVIEW

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Abstract
The goal of this review is to make it evident how diet habits, certain foods, and minerals like antioxidants relate to sadness. As stated by the current review, diet and nutrition are important factors both of the clinical prevention as well as oversight of depression. The onset, persistence, and severity of depressive disorders in addition to the seriousness of depressive symptoms, are significantly influenced by nutrients, foods, and other dietary components. Nutrition and the onset and progression of Depression and other mental diseases are increasingly being linked. The connection between nutrition and Depressive disorders are a complex and expanding area of research has important ramifications for both treatment and prevention, to sum up. The current study emphasizes the value of eating a healthy, nutrient-rich diet as an adjuvant approach in the all-encompassing approach to treating depression. Despite the fact that larger clinical trials and mechanistic investigations are needed to clarify the specific relationships between foods, the gut microbiota, and brain function, there is yet insufficient evidence to make any conclusive statements. Incorporating nutritional considerations into the therapeutic paradigm has the potential to enhance general mental health and quality of existence for those who are in depression.

Approach & methodology: To find human studies published during the previous ten years, an electronic literature search was carried out in PubMed, Research Gate, Shod Ganga, and Google Scholar. The following keywords or phrases were used in the search: food, nutrition, depression, and mental health.

Keywords: - Depression, Nutrition, Nutrient, Mental health.

Introduction

While the correlation between inadequate food intake and depression is not well recognized, it is widely recognized that poor diet can result in physical illness. In general, people think that only physical or emotional factors contribute to depression. However, the onset, severity, and course of depression can all be significantly influenced by nutrition. (1)**.** Depression is a common long-term medical condition that can impact one's emotions, thoughts, and physical well-being. It is typified by a depressed state of mind, low energy, melancholy, sleeplessness, and a failure to appreciate life. Clinical research has, however, thus far demonstrated that patients with depression do not experience a successful course of treatment. In light of these recent findings, these experts will review depression

in this special issue in a systematic manner, covering everything from behavior to cellular and molecular levels. They will pay particular attention to a number of fascinating subjects, including "The neurobiological mechanisms and treatments of REM sleep disturbances in depression," "Research on the pathological mechanism and drug treatment mechanism of depression," "The Antidepressant-like Effects of Estrogen-mediated Ghrelin," "The Effects of Calorie Restriction in Depression and Potential Mechanisms," and "The effects of psychological stress, Anxiety, Depression, and Insomnia: Herbal Medicine" and "On Depression" New information for treating or supplementing treatment for clinical depression will be provided by these reviews.(2)

Some research examines depressive people's diets. These investigations indicate that the nutrition of depressed patients is inadequate. They eat poorly and make poor food selections that can make them depressed. Low serotonin levels are linked to suicide, according to recent studies. (3)**.**

There are several ways in which health literacy mediates the association between self-care behaviors and depression. Thus, especially during the COVID-19 epidemic, it is critical to comprehend the knowledge that people possess and the way that affects their behaviors, mental health, and fragility. It is well established that life quality be enhanced by health literacy and access to health information, but the proper information must be given and delivered in an acceptable manner. (4)**.**

Dietary neuroscience is a young area that studies how dietary factors impact thinking, acting, and feeling in people. Obsessive-compulsive disorder (OCD), bipolar disorder, schizophrenia, and depression are the mental health conditions that most frequently are now common in many nations.(5)
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This research project found a strong association between the level of assistance subjects with meals required and depression among those in the dysphagia group. Additionally, it was discovered that the dietary factors affecting depression in patients with swallowing problems increased the degree of help needed during meals and decreased the amount of food consumed during meals. Based on the previously mentioned findings, dysphagia patients' sadness is likely caused by limitations and discomfort during meals, which make it impossible for them to eat on their own. According to earlier research, individuals with dysphagia had better standard of living when they consumed more food, and direct oral intake had a major impact on life satisfaction in these patients. (6)**.**

The growing field of study known as nutritional psychiatry focuses on the application of dietary interventions in in the management and elimination of mental health problems. Nutritional advice is rarely given to mental patients in professional practice, despite mounting evidence of its positive effects. Nutritional Recent research has demonstrated that treatments have an antidepressant impact in good quality intervention studies. (7).

Health promotion, which includes psychoeducation on lifestyle factors like nutrition, sleep, and exercise that are known to play a significant role in the etiopathogenesis of the condition, may be the first step towards preventing depression.(8)

Mood and brain processes can be impacted by food abnormalities (9)**.**

Because the foods we eat affect our cognition, memory, and emotions, balanced nutrition is crucial for our way of thinking and acting. When implementing nutritional techniques to combat MDD, isolated nutrients are another component with a healthy diet as well (10)**.** The primary focus is on neurotransmitters, where activated substances in various brain regions actively contribute to the production of nerve impulses, consequently regulating our mental faculties and emotions. Different foods and various neurotransmitters interact differently, resulting in different moods (11)**.**

Scientists have a very specific definition of emotion: it is the acute response to opportunities or threats that shows itself as erratic shifts in experience, behaviors, or physiology(12).

AFFECTIVE ASPECTS OF NUTRITION ON MENTAL HEALTH

One element of nutritional factors related to the state of their mental health at common is that they are linked to cardiovascular disease risk. Omega-3 Since they are widely recognized for their heart-protective qualities. Homocysteine metabolism involves vitamin B12, folate, and vitamin B6. Deficits in these nutrients raise blood homocysteine levels, which worsen mental health. Increases in high-density lipoprotein cholesterol and improved lipidomic profiles can be achieved with niacin, but

vitamin D is linked leading to a higher chance of cardiovascular disease and syndrome of metabolism. The advantages for mental health of these nutrients. Conversely, however, consuming excessive amounts of sugar and saturated fat, which are CVD risk factors, is bad for the brain. Furthermore, new research provides encouraging proof that some eating regimens, for instance, the Mediterranean diet, can be used. (13)**.**

It has been mentioned in this study how crucial different nutrients are for treating depression and maintaining other forms of mental health.

Carbohydrates: - The structure and operation of an organism depend heavily on the naturally occurring polysaccharides known as carbohydrates. Carbohydrates affect the mood and behavior in human body. The release of insulin in the body is triggered by eating a carbohydrate rich meal. Insulin facilitates the entrance of blood sugar into cells, where it may cause the brain to absorb tryptophan and be used for energy. Tryptophan has an effect on the concentrations of neurotransmitters in the brain. Because diets high in carbohydrates promote the creation of tryptophan and serotonin, which increase feelings of wellbeing. but low carbohydrate diets tend to produce sadness. Depression symptoms can range in severity from mild to severe, and the likelihood of developing them increases with diet carbohydrate to fibre ratios(14).

Protein (amino acids) Amino acids are the building blocks that make up proteins. Which are essential for life. There are only 12 amino acids that the body can make on its own; the other 8 (essential amino acids) must be received through diet. Nutritional Protein Studies on the connection between diet protein and depression are scarcer. Diets low in protein have been linked to a higher risk of depression in both Korean and American populations. When the percentage of calories from protein rises by 10%, the prevalence of depression among the macronutrients—carbs, protein, and fat—reduces dramatically in both the United States and South Korea. Food-based Protein. The abundance of amino acids found in dietary protein can be used to augment the amino acids the body needs to sustain normal physiological activities. Depression can be effectively treated by increasing serotonin levels in the brain, which are produced in part by the amino acid tryptophan found in diet protein. A diet low in tryptophan is linked to an increased incidence of depression, according to a survey by Euter et al. (15)

Omega-3 PUFAs- Brain has highest lipid levels (fats) among all the organs in the body. Brain lipids are composed of fatty acids. These are the structural constituents of membranes. Gray matter is thought to contain 50 % polyunsaturated fatty acids (approximately 33 % of which belong to the omega-3 family), which must be obtained through diet. One of the earliest experimental demonstrations of the impact of dietary components (nutrients) on the growth and activity of the brain involves fatty acids omega-3, specifically alpha-linolenic acid (ALA). According to recent research, reducing plasma cholesterol with food and medication improves depression. Blood lipid levels as well as the biochemical and biophysical characteristics of cell membranes are influenced by levels and ratios of omega-6 and omega-3 polyunsaturated fatty acids (PUFA). It has been hypothesized that consuming enough long-chain PUFAs, especially DHA, will help prevent depression.(16).

Vitamins: -

Vitamin B Complex & B12 and Folate: - While physiologically significant vitamin B12 deficiency was linked to a two-fold increased risk of severe depression (17)**.** Vitamin B6, folate, and vitamin B 12 are the B vitamins that have been studied in particular in relation to the brain. They are particularly prevalent in uncooked foods, meat products like liver and beef, and seafood like tuna and turkey. Because these B vitamins are cofactors in many catalytic reactions in the human body, which are necessary for neurotransmitter production and function as well as myelination of the spinal cord and brain, they help the central nervous system function as best it can. (18)

Vitamin D- A crucial part that vitamin D plays in many physiological processes, including the regulation of cell growth, the function of muscles, the prevention of cancer, metabolic signaling,

inflammation, and immunology. Vitamin D toxicity rarely occurs but is caused by consuming excessively high doses. Doses >50,000–100,000 IU/day can cause hypercalcemia and hyperphosphatemia(19). Vitamin D is integral in a number of brain processes including neuroimmunomodulation, neuroplasticity, neuroprotection, and brain development, which suggests its potential link to depressive disorders (20).

Minerals

Calcium: - SSRIs, or specific inhibitors of serotonin reuptake, were discovered in a recent study to reduce the absorption of calcium into the bones. Additionally, SSRIs may lower blood pressure in users, which increases the risk of falls and broken bones. Patients who are at risk for depression or some mental health issues could have a higher fracture risk if doctors indiscriminately prescribe SSRIs to them and take them. Because of their age and the reality that they are at this time taking other medications, they can be predisposed to osteoporosis (19)**.**

Iron: - Research points to a connection between iron deficiency and mental health problems, such as depression. Abnormal iron levels cause the brain's basal ganglia, a reservoir of iron, to react quickly, which in turn inhibits the brain's capacity to process emotions. A recent study found that, in comparison to healthy control subjects, patients with iron-deficiency anemia had a considerably higher frequency of anxiety disorders, depression, and sleep disturbances.(21). Weakness, exhaustion, and a reduction in both physical and mental function are linked to iron deficiency, and patients with concurrent pathologic diseases tend to have worse results. On the other hand, too much iron, or iron overload, can be harmful as it triggers the production of reactive oxygen species and oxidative stress, both of which are linked to the etiology of neurodegenerative illnesses like multiple sclerosis. Iron metabolism abnormalities, frequently associated with increased iron deposition, have been demonstrated to coexist with a number of chronic neurological illnesses, including multiple sclerosis (MS).(22)

Zinc: - All creatures need zinc, an essential trace element, for a variety of biological functions. Psychiatrists do not fully understand the role zinc homeostasis plays in clinical depression and psychosis, despite the fact that its general effects are widely researched and are summarized in this work and numerous outstanding reviews. Zinc is a component of hundreds of enzymes and proteins and is the second most abundant divalent cation after calcium. Zinc plays a crucial part in more than 300 biological processes and is necessary for healthy cell function, including endocrine, immunological, and neurological systems as well as DNA replication, transcription, protein synthesis, membrane maintenance, and cellular transport. Zinc supplementation may lessen the amount of psychotropic medication needed, resulting in higher adherence, reduced costs, and better outcomes, as current research suggests probable roles for zinc in lowering both depressive and psychotic symptoms. Owing to the diversity of mental health conditions, more precise research is needed to identify the subgroups that might benefit most from zinc supplementation. It is obvious that additional research is required to fully understand how zinc affects neuropsychiatric disorders.(23). Zinc primarily functions in excess of 300 enzymes as a cofactor reaction and is necessary for the production of proteins, cells proliferation, neurogenesis, DNA repair, gene transcription, and other processes. Additionally, zinc modulates immunological and inflammatory processes and alters cytokine levels in the body (24). Zinc deficiency may increase cortisol levels, decrease neurogenesis and neuroplasticity, and disrupt glutamate homeostasis, all of which might aid in the growth of depressive disorders (25).

Magnesium-Magnesium levels can impact CNS function, as it plays a role in DNA replication, transcription, and translation (25). Magnesium acknowledged as well for its capacity to antagonize the NMDA glutamate receptor, the mechanism thought to be behind its antidepressant and neuroprotective effects(26).

Selenium: A number of selenoproteins depend on selenium as a vital component for their proper operation. Because selenium can lower oxidative stress and inflammatory indicators, improve endothelial function, and enhance serotonin synthesis and function, it may play a role in the development of depression.(27).

Tables of nutrients: -

S.No.	Name of nutrients	Year & author	Findings
1.	**Carbohydrate**	**Magdalena Zielinska2018**	An increased chance of depression is correlated with increased consumption of low-quality carbs and added sugars.(14)
2.	**Proteins**	**Qingyi Huang et.al. 2019**	Because amino acids are used to create many neurotransmitters in the brain, protein consumption has an influence on psychological well-being and brain function. The neurotransmitters serotonin and dopamine are produced by the amino acids' tryptophan and tyrosine, respectively.(10)
3.	**Omega -3 pufa6**	**Ombeer Singh et.al 2022**	According to research, a shortage in fatty acids omega-3 and the increased depressive symptoms linked to low plasma cholesterol could be attributed to an imbalance in the ratio of EFAs, particularly omega-6 and omega-3 fatty acid.(1)
4.	**B-complex B12 & folate**	**Stefan Markun 2021**	Vitamin B12 is frequently used to treat fatigue, depression symptoms, and cognitive decline. These problems are typically not linked to severe neurological illnesses or overt vitamin B12 insufficiency, therefore it's unclear if vitamin B12 supplements are helpful in these situations.(28)
5.	**Vitamin-D**	**Bischoff-Ferrari et. al. 2010**	Vitamin D deficiency has been demonstrated to be connected to the existence of mood disorders and reduced cognitive functioning.(19)
6.	**Calcium**	**Bischoff-Ferrari et.al. 2010.**	If clinicians indiscriminately give SSRIs to patients and they take them, then patients may have a higher fracture risk for depression or other mental health disorders. They may be predisposed to osteoporosis because of their advanced age and the reality that they are at this time taking other drugs.(19)
7.	**Iron**	**Shinsuke Hidese 2018**	The hypothesis that micronutrients, such as iron, have distinct impacts on the brain and mood is supported by our data. Dietary iron consumption and depression risk were found to be inversely correlated in a recent meta-analysis. Numerous correlations have been proposed between iron levels

			and cognitive processes. It is important to remember that iron contributes to depression by acting as a cofactor for the enzyme's tyrosine and tryptophan hydroxylases, which are in charge of synthesizing monoamines (dopamine and serotonin).(29)
8.	**Zinc**	**Damanpreet Kaur 2019**	Immune system operating normally, possessing anti-inflammatory characteristics stopping apoptosis, Sense of taste Cognitive performance Zinc is a vital vitamin that is involved in DNA synthesis, enzymatic catabolism, transcription, signal transmission necessary for immune cell function, and many micronutrient metabolisms. Low levels of zinc in the blood have been linked to immune system weakness, increased susceptibility to infections, and an increased risk of morbidity in the elderly.(30)
9.	**Magnesium**	**Wang J et.al. 2018**	Magnesium levels are crucial for the health of the nervous system (CNS) in general and may be linked to diseases like Alzheimer's, diabetes, stroke, hypertension, migraines, and disorder of attention deficit hyperactivity.(25)

Conclusions: - A well-known, complex neuropsychiatric condition having a high prevalence is depression. Despite the fact that a number of treatments have been suggested thus far, many are linked to inadequate nutrition. The principles of diet and nutrition may be incorporated into future depression intervention programs since research has shown that they are important in the prevention and therapeutic treatment of depression. Diet and nutrition can be a part of an all-encompassing plan for preventing depressive issues. Better public and clinical education regarding the function of diet and nutrients in preserving mental health is urgently needed in the meantime. In the future, more It is important to pay attention to developing a diet therapy which emphasizes not only meals but also the combination with exercise and favorable lifestyle variables in order to prevent, treat, and maintain mental health. In patients with mental problems, the study outlined will identify nutritional needs and potential hurdles to eating healthfully. The findings will aid in developing guidelines for nutritional risk assessment in mental health patients as well as for organizing successful dietary therapies.

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