Dietary Modification for Depression: A Case Report

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Abstract

Depression is a common psychiatric disorder characterized by core symptoms of depressed mood, anhedonia, and loss of energy, with a complex pathogenesis involving genetic, environmental, biochemical, and psychological factors. Patients with depression frequently exhibit a hypoenergetic state that is manifested not only in the core symptoms of depressed mood, anhedonia, and loss of energy, but may also be associated with systemic energy metabolism abnormalities. In recent years, the 'gut-brain axis' theory has demonstrated that gut microbiota influences mood through mechanisms including metabolites, neuroinflammation, and neurotransmitter modulation, and is closely associated with depression. Dietary composition significantly impacts gut microbiota constitution, and high-fat diets may induce depressive symptoms through multiple mechanisms. For depression patients with a preference for meat, direct transition to a dietary pattern dominated by low-fat fruits and vegetables may prove difficult to implement. Therefore, the present study explores the potential effects of different meat types on alleviating depressive symptoms, aiming to identify which meat is more suitable for depression patients, thereby providing scientific evidence for dietary intervention. Based on chicken' s characteristics of being low-fat, having moderate energy content, and being rich in fast-twitch muscle fibers, this study investigates its potential role in dietary intervention for depression. Through dietary modification experiments in two patients with depression, with chicken as the sole meat source, results demonstrated significant improvement in depressive symptoms, mood stabilization, and enhancements in cognitive function, gastrointestinal function, and skin condition. Analysis indicates that chicken may alleviate depressive symptoms and related somatic symptoms by optimizing gut microbiota balance, reducing inflammatory responses, and improving regulation of the brain-gut-skin axis. Despite these positive findings, the study has limitations, including small sample size and inadequate control of other dietary components. Future research should expand sample size, employ randomized controlled trial designs, and integrate biomarker analysis to fur-

ther elucidate the mechanisms of chicken in dietary intervention for depression, providing scientific evidence for dietary optimization in depression patients.

Full Text

Dietary Adjustment for Depression: A Case Report

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Abstract

Depression is a common mental disorder characterized by low mood, decreased interest, and loss of energy. Its pathogenesis is complex, involving genetic, environmental, biochemical, and psychological factors. Patients with depression often exhibit a low-energy state, which is not only reflected in core symptoms such as low mood, decreased interest, and loss of vitality but may also be associated with abnormal overall energy metabolism in the body. In recent years, the "gut-brain axis" theory has demonstrated that gut microbiota influences mood through mechanisms involving metabolic products, neuroinflammation, and neurotransmitter regulation, establishing a close relationship with depression. Dietary structure significantly impacts gut microbiota composition, and high-fat diets may induce depressive symptoms through multiple mechanisms.

For patients with depression who prefer meat, directly switching to a diet primarily composed of low-fat fruits and vegetables may be difficult to implement. Therefore, this study explores the potential role of different types of meat in alleviating depressive symptoms and aims to identify which meat is more suitable for depression patients, thereby providing a scientific basis for dietary intervention. Based on chicken' s characteristics of being low in fat, having moderate energy content, and being rich in fast-twitch muscle fibers, this study investigates its potential role in dietary interventions for depression. Through dietary adjustment experiments with two depression patients who were only allowed to consume chicken, the results showed significant improvement in depressive symptoms, with mood stabilization and enhanced cognitive function, gastrointestinal function, and skin condition. Analysis suggests that chicken may alleviate depressive symptoms and related somatic manifestations by optimizing gut

microbiota balance, reducing inflammatory responses, and improving regulation of the brain-gut-skin axis.

Despite these positive results, the study has limitations, including a small sample size and lack of strict control over other dietary components. Future research should expand the sample size, adopt randomized controlled trial designs, and incorporate biomarker analysis to further explore the mechanisms of chicken' s role in dietary interventions for depression, providing a scientific basis for optimizing dietary recommendations for depression patients.

Keywords: Dietary therapy, Low-fat diet, Depression, Brain-gut-skin axis

1. Introduction

Depression is a common mental disorder with clinical manifestations encompassing emotional, cognitive, and somatic symptoms. The core symptoms include low mood, decreased interest and anhedonia, fatigue, and loss of vitality or energy. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), diagnosis requires: (1) persistent low mood and loss of interest for at least two weeks; (2) accompanying depressive symptoms such as sleep disturbances, appetite changes, poor concentration, and feelings of worthlessness; (3) functional impairment in daily life; and (4) exclusion of other medical conditions or medication side effects that could cause similar symptoms. World Health Organization data indicate that approximately 350 million people worldwide suffer from depression, with a nearly 18% increase in cases over the past decade (Chen, 2022). The COVID-19 pandemic has further exacerbated this trend, posing unprecedented challenges to global public mental health.

Current treatments for depression primarily rely on medication and psychological counseling. Antidepressant medications work mainly by regulating neurotransmitter levels in the brain. Commonly used antidepressants include selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), noradrenergic and specific serotonergic antidepressants (NaSSA), tricyclic antidepressants (TCAs), tetracyclic antidepressants, and monoamine oxidase inhibitors (MAOIs) (Lu et al., 2017). However, research reports that antidepressants carry numerous adverse effects, including sexual dysfunction, gastrointestinal reactions, increased anxiety, drowsiness, and even suicidal ideation (Riediger et al., 2017). Moreover, long-term use may lead to drug resistance, gradually reducing efficacy and forcing clinicians to frequently adjust dosages or switch medications, thereby increasing treatment complexity and patient suffering.

Psychotherapy also plays a crucial role in depression treatment. According to the "Guidelines for Primary Care Diagnosis and Treatment of Depression (2021 Edition)," psychotherapy is as effective as antidepressants for mild to moderate depression, but for severe depressive episodes, it typically cannot be used alone

and must be combined with medication. Psychotherapy employs various therapeutic approaches to help patients relieve emotional stress, restructure cognitive patterns, and improve behavioral styles. Cognitive-behavioral therapy guides patients to self-monitor, self-examine, and self-regulate maladaptive cognitive and behavioral patterns, correcting automatic irrational thoughts to improve depressive symptoms and promote healthy interpersonal development. Psychodynamic therapy focuses on uncovering deep-rooted conflicts from the patient' s psychological dynamics. Interpersonal psychotherapy is a short-term, structured approach focusing on the interaction between emotional disorders and interpersonal relationships, addressing four core areas: interpersonal conflicts, role transitions, complicated grief, and interpersonal deficits, thereby improving social skills and conflict resolution abilities. Family therapy adjusts relationship patterns within the family system from a systemic perspective, creating a supportive environment for recovery. Supportive psychotherapy provides emotional support, helps build positive social networks, reduces psychological burden, and teaches relaxation techniques such as deep breathing and meditation.

The etiology and pathogenesis of depression are extremely complex, involving genetic, environmental, biochemical, and psychological factors (Weng et al., 2014). The "microbiota-gut-brain axis" theory posits that gut microbiota profoundly influences mood and behavior through multiple mechanisms closely related to depression' s pathophysiology (Qin et al., 2022; Zhao et al., 2024). Specifically, gut microbiota affects mood and behavior through: (1) metabolic products such as short-chain fatty acids (SCFAs) that influence central nervous system function and mood regulation (see, e.g., Dalile et al., 2019; He et al., 2023; Hosking et al., 2019; Zang et al., 2023), while dysregulated metabolites (e.g., endotoxin lipopolysaccharide) may trigger neuroinflammation and worsen depressive symptoms (Xie et al., 2024); (2) activation of the host immune system, inducing systemic inflammatory responses that significantly affect brain function (Li et al., 2020; Liu et al., 2024); (3) when intestinal barrier function is compromised, bacterial components and metabolites enter the bloodstream, activating microglia and triggering neuroinflammation that exacerbates depressive symptoms (Ghosh et al., 2021); (4) influence on neurotransmitter synthesis and function, such as serotonin, where dysbiosis may cause abnormal neurotransmitter levels and trigger depression (Yano et al., 2015); and (5) the vagus nerve, a key pathway connecting the gut and brain, transmits signals from microbial metabolites to the brain, with vagal dysfunction closely linked to depression onset (Siopi et al., 2023).

Research demonstrates that dietary structure significantly affects gut microbiota composition and function (see, e.g., David et al., 2014; Graf et al., 2015; Zhang, 2022), suggesting that certain diets may disrupt microbiota balance, disturb brain-gut axis regulation, and induce or worsen depressive symptoms. Recent studies indicate that high-fat diets (HFD, $ 30 $), inducing neuroinflammation and depressive-like behaviors (Deng, 2015). Third, they activate the HPA axis, elevating corticosterone and leptin levels with increased brain oxidative stress, triggering depression and anxiety (Kurhe et al., 2015). Additionally, high-fat di-

ets interfere with tryptophan metabolism (e.g., serotonin, kynurenine), inducing anxiety and depressive behaviors (Li et al., 2023). They also alter gut microbial balance, impair intestinal barrier integrity, and exacerbate neurobehavioral disorders through inflammatory responses (Li et al., 2023). Other mechanisms such as oxidative stress may also contribute. In summary, high-fat diets may induce depression through multiple mechanisms affecting brain function and mood regulation.

For patients who prefer meat, directly switching to a low-fat, fruit-and-vegetable-based diet may be difficult. Therefore, this study explores the potential role of different meats in alleviating depressive symptoms and aims to identify which meat is most suitable for depression patients, providing scientific evidence for dietary intervention. Previous research indicates that vegetarians have significantly higher depression risk than meat-eaters. Kohl et al. (2023) found that vegetarians have nearly double the depression risk of meat-eaters, reporting significantly higher rates of poor concentration and forgetfulness. This may stem from: (1) potential deficiencies in key nutrients like vitamin B12 and omega-3 fatty acids due to dietary restrictions; (2) greater social pressure and psychological burden in meat-dominant cultures; and (3) the possibility that depressive symptoms themselves prompt dietary changes toward vegetarianism. Considering these factors, this study focuses on examining the potential mechanisms of different meats (red meat, white meat, and fish) on depressive symptoms to determine which offers advantages in dietary intervention, providing scientific basis and personalized recommendations for depression patients' dietary adjustments.

2. Theoretical Basis for Chicken as an Intervention

Based on nutritional data from the *China Food Composition Tables Standard Edition (6th Edition)*, different meats vary in fat content and energy density. Among common livestock and poultry meats, pork (representative value) contains 30.1% fat with 1370 kJ/100g energy; beef contains 8.7% fat with 669 kJ/100g; lamb contains 6.5% fat with 581 kJ/100g; chicken contains 6.7% fat with 608 kJ/100g; duck contains 19.7% fat with 996 kJ/100g; and goose contains 19.9% fat with 1041 kJ/100g. Overall, chicken and lamb have relatively low fat percentages among these meats. Since depression' s core symptoms reflect a low-energy state, patients may require adequate energy supplementation. Among low-fat meats, chicken has moderately higher energy density, potentially providing appropriate energy supplementation while avoiding adverse effects from high-fat diets. We hypothesize that chicken, as a low-fat, moderate-energy meat, may be a recommended choice for optimizing dietary structure and alleviating depressive symptoms.

From a muscle tissue perspective, vertebrate muscle fibers can be classified as slow-twitch (red muscle fibers, hereafter "slow muscle") and fast-twitch (white muscle fibers, hereafter "fast muscle"). Slow-twitch fibers (Type I) are suited for prolonged low-intensity activity with high endurance but lower

strength and speed, relying primarily on oxidative phosphorylation—a process requiring oxygen that converts glucose, fatty acids, and amino acids into ATP via mitochondria. Fast-twitch fibers (Type IIB) are suited for high-intensity, short-duration activity with higher strength and speed but poorer endurance, generating energy rapidly through glycolysis, an anaerobic process that breaks down glucose into lactate and ATP.

Given that depression patients generally exhibit low-energy states, consuming foods high in fast-twitch fibers may help them obtain energy more quickly, thereby increasing strength and speed to accomplish daily tasks. Among low-fat meats, chicken has the highest proportion of fast-twitch fibers, potentially making it optimal for depression patients' diets.

Research shows that common low-fat meats like chicken, beef, and lamb differ in slow-twitch (Type I) and fast-twitch (Type IIB) fiber ratios. Studies on frequently consumed muscle portions reveal: Yang et al. (2000) found that in Jingbai 904 chickens, both rooster and hen pectoral muscles consist entirely of fast-twitch and intermediate fibers (0% Type I), while leg muscles contain 15.22$±4.75±5.78±4.62±5.07±11.13±$12.05% (hen) Type IIB fibers. Thus, chicken breast has extremely high fast-twitch fiber content, giving chicken significant advantages for rapid energy provision.

In contrast, beef has lower fast-twitch fiber proportions than chicken. Xie et al. (2011) found that in six Chinese cattle breeds, the longissimus dorsi muscle contains 14.2%-32.7% slow-twitch (Type I) fibers and 43.2%-61.2% fast-twitch (Type IIB) fibers, indicating beef can provide some rapid energy but less effectively than chicken.

Lamb has even lower fast-twitch fiber proportions than both chicken and beef. Hou et al. (2021) studied Inner Mongolia Sunit sheep, finding that under housed conditions, the longissimus dorsi contains 9.80% Type I fibers and 57.68% Type IIB fibers, while under grazing conditions, Type I increases to 11.53% and Type IIB decreases to 45.74%. Overall, lamb' s fast-twitch fiber proportion is lower than chicken and beef but can still provide rapid energy to some extent.

In summary, among common low-fat meats, chicken has the highest fast-twitch fiber proportion, followed by beef, with lamb being relatively lower. Therefore, chicken is not only low in fat and moderate in energy but also high in fast-twitch fibers for rapid energy provision, making it potentially optimal for dietary optimization in depression patients.

3. Case Report

3.1 Patient Profiles

Patient 1: Male, 18 years old. Presented with suspected somatic symptoms including hand weakness and occasional dizziness. Post-COVID-19, experienced a one-month sequelae of inability to speak normally. Previously took venlafaxine hydrochloride but experienced severe adverse reactions, forcing discontinuation.

Patient 2: Female, 35 years old. Long-term low mood and low energy, manifesting as emotional depression, irritability, and symptoms of headache, mental inflexibility, and dullness when tense or fearful. Significant social dysfunction, including social avoidance, minimal interaction, and self-reported numbness. Reported childhood trauma: at age 10, her father' s alcohol-induced mental disorder went untreated, plunging the family into crisis, after which both her mother and she developed depressive symptoms while her siblings were unaffected. Since high school, she placed significant pressure on herself, remaining in a state of confusion, depression, and numbness for 17 years with low self-worth. Developed tuberculosis in 2019 from chronic depression, treated for one year. In 2020, experienced leg stiffness. In 2023, received traditional Chinese medicine treatment for severe headaches at Nanjing Provincial Hospital of Traditional Chinese Medicine for six months. Additionally, since September 2023, she has received approximately 70 sessions of psychodynamic psychotherapy.

3.2 Dietary Intervention and Outcomes

3.2.1 Dietary Adjustment Protocol During the dietary adjustment period, patients were permitted to consume only chicken as their meat source, while maintaining their existing dietary habits for other foods. Patients recorded their daily diet through photographs and reported mood states and somatic symptoms.

3.2.2 Post-Intervention Case Reports **Patient 1** began dietary adjustment on October 9, 2024. He reported significantly improved memory since high school, stating by October 14, 2024, that his memory had returned to elementary school levels. Observers noted increased classroom engagement, active participation, frequent interaction with his desk mate, and proactive side-turning communication. The patient self-reported significant mental state improvement, reduced dizziness, and improved complexion and energy. By November 30, 2024, he had gained 2 kg (from 60 to 62 kg) and exhibited binge-eating behavior for several days with significantly increased food intake. By December 9, 2024, his appetite gradually returned to normal levels. By late December, his overall condition continued improving, with neighbors reporting he became more cheerful, showing significantly improved social relaxation that extended beyond familiar circles, markedly enhancing overall quality of life.

Patient 2 began dietary adjustment on December 27, 2024. By January 5, 2025, she reported experiencing self-appreciation for the first time, feeling increasingly satisfied with herself. By January 9, 2025, she reported being able to control anger when it arose, unlike previous emotional outbursts. By February 14, 2025, she reported no longer feeling sad, with significantly improved emotional state and overall psychological stabilization.

4. Discussion

Based on the hypothesis that chicken, as a low-fat, moderate-energy meat, may help alleviate depressive symptoms, this study observed the effects of chicken consumption on depressive symptoms and related physiological manifestations in two depression patients. Results showed both patients experienced significant depressive symptom improvement, mood stabilization, and enhanced quality of life after dietary adjustment. This suggests chicken may provide rapid energy supplementation through its low-fat characteristics and high fast-twitch fiber content while avoiding neuroinflammation and mood disturbances potentially triggered by high-fat diets. Thus, this study provides preliminary evidence for chicken' s potential positive role in dietary optimization for meat-preferring depression patients.

Beyond self-reports, this study further examined dietary adjustment' s positive effects on cognitive function through voice feature analysis. Recorded interviews were conducted before and after dietary adjustment, analyzed using Praat software. Results showed that after adjustment (January 24, 2025), both patients' speech continuity improved, with pause duration during sentences decreasing from 0.374 to 0.074 (Patient 1) and from 0.21 to 0.13 (Patient 2) as a proportion of total sentence duration. This indicates more fluent verbal expression with reduced pauses, likely reflecting cognitive function recovery. Depression patients often experience cognitive impairment, including attention, memory, and verbal expression deficits, and dietary adjustment may promote cognitive recovery by improving brain metabolism and neurotransmitter levels, reflected in enhanced verbal fluency. Notably, while volume is an important indicator of energy state, this study did not analyze volume levels because recordings were made on patients' own mobile devices without standardized equipment or distance, potentially introducing significant bias. To ensure data reliability, volume was excluded as an analytical metric, focusing instead on more stable voice features like pause proportions.

In addition to emotional and cognitive improvements, both patients reported significant gastrointestinal and skin symptom improvements. Patient 1 reported improved constipation and overly dry stools, with significant reduction in back acne and leg folliculitis. Patient 2 reported transitioning from constipation to regular bowel movements and elimination of vague abdominal pain that previously occurred 70-80% of the time daily. These changes support the brain-gut-skin axis theory, which posits that gut microbiota influences not only neurological health through neurotransmitter synthesis, immune response, and intestinal barrier function but also skin health through immune-inflammatory and metabolic mechanisms. Dietary adjustment may optimize gut microbiota balance, reduce inflammatory responses, improve intestinal function, and thereby enhance mood and skin health through brain-gut-skin axis regulation. This finding provides a new perspective for depression dietary intervention, suggesting that dietary adjustment may simultaneously alleviate depressive symptoms and related somatic manifestations by optimizing gut microbiota and reducing

inflammation.

Dietary adjustment as a non-pharmacological intervention offers significant advantages. First, it avoids medication side effects, providing a safer treatment option. Second, compared to expensive antidepressants, dietary adjustment is more cost-effective, reducing economic burden. Additionally, as a continuous intervention, it rarely causes symptom rebound, giving patients greater sense of control over their health and enhancing self-efficacy and psychological resilience.

These results provide a new perspective for depression dietary intervention, suggesting that improving gut health may not only relieve depressive symptoms but also improve related somatic and skin symptoms. However, further investigation is needed into the specific mechanisms of microbiota regulation in dietary intervention, particularly differences across depression subtypes.

Despite positive results, this study has limitations. First, dietary adjustment was limited to chicken as the only meat source without strict control of other dietary components, such as other fat sources. Future research should control other oil intake, potentially adopting Mediterranean diet patterns. The Mediterranean diet, rich in unsaturated fatty acids, dietary fiber, and antioxidants, has proven benefits for cardiovascular health and cognitive function. Combining Mediterranean dietary advantages with chicken consumption could clarify chicken' s specific role in more complex dietary structures to optimize depression dietary interventions. Second, future studies should expand sample sizes, adopt randomized controlled trial designs, and incorporate biomarker analysis such as neurotransmitter levels, inflammatory factor concentrations, and gut microbiota diversity to validate intervention mechanisms and effects. Additionally, comparative studies of different meats warrant further investigation to clarify specific roles of various meat types in depression dietary interventions.

5. Conclusion

This study preliminarily validates the potential benefits of low-fat chicken in depression dietary intervention, with improvements in mood, language ability, gastrointestinal symptoms, and skin condition further supporting diet' s positive impact on depression. These findings offer new insights for dietary optimization in depression patients, particularly when dietary changes are difficult to implement. Chicken, as a low-fat, moderate-energy meat with high fast-twitch fiber content, may serve as a feasible dietary intervention option. Future research should build upon these findings to explore more comprehensive dietary patterns, integrating multidisciplinary perspectives to propose more scientific and systematic dietary intervention protocols to support comprehensive depression treatment.

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Note: Figure translations are in progress. See original paper for figures.