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Impact of Different Dietary Patterns on Adolescent Depression

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Abstract:

According to the World Health Organization, depression has become the fourth most common disease in the world, which has become a prevalent psychological issue affecting the adolescent population. Its symptoms not only impact adolescents' emotional states but also severely interfere with their daily academic efficiency and quality of life. In recent years, dietary therapy, as an emerging non-pharmacological intervention, has demonstrated unique advantages and played a significant role in alleviating depressive symptoms in adolescents. This paper systematically elaborates on three representative dietary patterns—the Mediterranean diet, vegetarian diet, and DASH diet—and provides an in-depth analysis of their specific application effects in improving depressive symptoms in adolescents. It further explores the mechanisms through which these different dietary patterns influence the regulation of depressive moods in adolescents and their application value. The study finds that reasonable dietary adjustments can not only improve the nutritional status of adolescents but also exert positive interventional effects on depressive symptoms through pathways such as the gut microbiota-brain axis.

Keywords: Depression; Adolescent; Dietary Patterns.

1. Introduction

Depression is a common mental disorder characterized by low mood, loss of interest, and easy fatigue. It has become a frequent affective disorder among adolescents, severely impacting social functioning and quality of life. A 2025 report indicated that the detection rate of depression among Chinese adolescents is 20.38%, higher than the 16.53% reported for Chinese adolescents aged 10-19 in the 2020 „China Family Panel Studies" project [1]. This suggests a rising trend in depressive disorders among adolescents in recent years.

Current treatment modalities include pharmacological interventions, psychotherapy, and exercise therapy, among others, yet none can achieve a complete cure. How to better manage adolescent depression is a critically important social issue today. Furthermore, the American Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), notes that individuals with depression commonly experience varying degrees of appetite loss and nutritional deficiencies, which may be related to their adopted

dietary patterns. That is, a correlation exists between adolescent depression and dietary habits, with poor dietary habits potentially increasing the risk of depression onset in adolescents.

Relevant articles in The Lancet have proposed that numerous scientific publications in recent years have been referencing the concept of „gut health," aiming to raise awareness about dietary components that may affect human health. The goal is to enable individuals to learn about and adopt dietary patterns beneficial to their health, thereby preventing or improving certain diseases. A standardized and reasonable dietary structure plays a certain role in reducing the risk of adolescent depression. Dietary patterns generally refer to the combination of foods and beverages consumed by an individual over a certain period, comprehensively considering the relationships among various nutrients and possessing functions such as influencing mood changes and regulating energy balance.

Currently, various dietary patterns, such as the Mediterranean diet, vegetarian dietary patterns, and anti-inflammatory dietary patterns, can, to some extent, improve the state of adolescent depression. However, existing research lacks a systematic review and analysis of the associations between different dietary patterns and adolescent depression. Therefore, this paper aims to analyze the impact of different dietary patterns on the intervention and treatment of adolescent depression, aiming to provide new insights for the intervention and treatment of adolescent depression.

2. Prevalence and Influencing Factors of Adolescent Depression

Adolescent depression has become an increasingly severe global public health issue, characterized by high prevalence, low recognition rates, and chronicity. Its primary clinical manifestations include depressed mood, diminished interest, and psychomotor retardation. According to World Health Organization statistics, the global prevalence of depressive disorders among adolescents aged 12-18 is approximately 12.5%, showing a year-on-year increasing trend. Relevant epidemiological surveys in China indicate that the detection rate of depressive symptoms among adolescents has reached 24.6%, with the proportion of major depression being approximately 7.4% [2]. Adolescents experience rapid development of self-awareness, active thinking, and abundant but volatile emotions, which significantly heighten their susceptibility to psychological disorders.

Some studies have shown that compared to adolescents with healthier dietary habits, those with poor dietary habits face a 3-4 times increased risk of depression [3]. The underlying mechanism may be that high-sugar and high-fat diets lead to increased saturated fat intake and elevated inflammatory levels, consequently exacerbating depressive and anxious moods in adolescents. However, poor dietary habits are not the sole determinant of adolescent depression; other factors include familial, social, environmental, and psychological influences. For instance, when adolescents face pressures from family, school, and society, they are prone to developing adverse psychological states. If not properly managed, these can more readily evolve into depression. Furthermore, parental phubbing (the behavior where individuals ignore companions or the current situation due to focusing on their mobile phones) not only directly influences the risk of adolescents developing depressive disorders but may also indirectly affect their mental health through mediating factors such as basic psychological needs and self-esteem levels [4]. Simultaneously, the adolescent population exhibits vigorous metabolism but weak self-regulation abilities, making them particularly vulnerable to the negative effects of nutritional deficiencies. Therefore, while focusing on adolescent mental health, it is imperative to attach great importance to their daily nutritional intake, ensuring they receive balanced and comprehensive nutrients. This approach not only helps prevent the onset of depressive symptoms but also provides essential physiological support for those already affected.

3. Characteristics of the Mediterranean Diet and Its Application in Adolescent Depression

3.1 Characteristics of the Mediterranean Diet Pattern

The traditional dietary pattern discovered in the late 1950s to early 1960s in olive-growing areas of Crete, Greece, and southern Italy is referred to as the Mediterranean Diet. Its distinctive features include: primary consumption of legumes, cereals, fruits, and vegetables; low to moderate intake of meat and dairy products; moderate alcohol consumption; and monounsaturated fatty acids constituting the main source of fat. As defined by Xu Chaofan et al., the key characteristics of the traditional Mediterranean diet are: high consumption of extra virgin olive oil, vegetables, fruits, whole grains, nuts, and legumes; moderate intake of fish, other meats, dairy products, and red wine; and low consumption of eggs and desserts. The Mediterranean diet is recognized as a healthy dietary pattern conducive to maintaining population health and reducing the

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incidence of major chronic diseases.

3.2 Effects of the Mediterranean Diet on Improving Adolescent Depression

Findings from an investigation exploring the association between the Mediterranean diet and mental health in an adolescent population revealed that depressive mood states significantly exacerbate the level of inflammatory response in adolescents. Among adolescents adhering to the Mediterranean diet, serum cortisol levels demonstrated a significant decreasing trend, with statistical analysis indicating a significant negative correlation ($p=0.002$) [5]. These results suggest that long-term adherence to the Mediterranean diet, rich in olive oil, whole grains, fresh fruits and vegetables, fish, and nuts, may effectively reduce levels of inflammatory factors in the body by modulating the function of the hypothalamic-pituitary-adrenal (HPA) axis, thereby positively influencing the improvement of depressive symptoms in adolescents. This dietary intervention approach provides a novel nutritional perspective for preventing and ameliorating mental health issues in adolescents.

A cross-sectional study involving 809 adolescents aged 13-18, categorized into low-protein and high-protein groups for analysis of their depressive status, showed a significant association between low-protein food intake and depression. Compared to adolescents without depressive symptoms, participants with depressive symptoms had lower protein intake and a higher proportion of carbohydrates in their diet. This indicates that the Mediterranean diet, as a low-protein dietary pattern, can effectively improve depressive conditions in adolescents [2,6].

Polyphenols present in the Mediterranean diet can inhibit monoamine oxidase activity in the brain, thereby enhancing monoaminergic neurotransmission and subsequently treating psychiatric disorders such as depression. Individuals adhering to the Mediterranean diet are better able to meet their nutritional requirements, and enhancements in physical fitness and quality of life contribute to the improvement of adolescent depression. Furthermore, the high content of dietary fiber and polyphenols in this diet serves as „fuel“ for beneficial gut microbiota, helping to shape a diverse and healthy gut microbiome. The gut-brain axis communication mechanism implies that a healthy gut microbiota can positively influence brain function and mood regulation through neural, immune, and endocrine pathways [7,8].

4. Vegetarian Dietary Pattern and Its Application in Adolescent Depression

4.1 Characteristics of the Vegetarian Dietary Pattern

The vegetarian diet is a plant-based dietary pattern characterized by the following features: Firstly, it is rich in dietary fiber. Vegetables, fruits, whole grains and other fiber-containing foods promote intestinal peristalsis, maintain gut health, increase satiety, and help to control weight. Secondly, it is low in fat. By avoiding animal fats, the diet is low in saturated fat and cholesterol, which can reduce the risk of chronic diseases and benefit heart health. Thirdly, it is abundant in vitamins and minerals. Vegetables, fruits, and nuts provide Vitamin C, Vitamin E, potassium, magnesium, among others. Fourthly, it is environmentally friendly [9].

4.2 Effects of the Vegetarian Dietary Pattern on Improving Adolescent Depression

A cross-sectional study involving 853 seventh and eighth-grade students utilized a Food Frequency Questionnaire (FFQ) to assess dietary intake and the Chinese version of the PHQ-9 scale to evaluate depressive symptoms. The results indicated that the vegetarian pattern was associated with a reduced risk of depressive symptoms, particularly in the third quartile (Q3) group. Compared to the first quartile (Q1), the risk of moderate or greater depressive symptoms was significantly lower (OR = 0.423, 95% CI: 0.202–0.888). This association remained significant after adjusting for basic variables such as grade, age, and sex; even after further adjusting for additional covariates including living situation, family structure, physical activity, and sleep, a protective trend persisted (OR = 0.475), though the statistical significance was slightly attenuated [10].

Another study investigating the relationship between dietary habits and adolescent depression included 160 adolescents with depression, categorized into three groups: plant-based diet predominant, animal-based diet predominant, and balanced omnivorous diet. Among the participants, 119 (74.38%) were non-depressed adolescents, while 41 (25.63%) exhibited depressive symptoms. Specifically, 36 (22.50%) had mild depression, 4 (2.50%) had moderate depression, and 1 (0.63%) had severe depression. Significant differences were observed between the groups regarding dietary structure, meal regularity, whole grain intake, late-night snacking habits, and sweet food consumption. The number of depressed adolescents adhering to a predominantly vegetarian diet was significantly lower than those following animal-based or balanced omnivorous diets, with the vegetarian group also demonstrat-

ing higher emotional stability and life satisfaction [9]. The underlying reason may be that the dietary fiber in plant-based foods helps maintain intestinal health, and a healthy gut can influence emotional states through mechanisms such as neurotransmitter secretion, potentially promoting greater calmness and composure in adolescents.

However, it is important to note that the iron primarily found in vegetables is non-heme iron, which has a relatively low absorption rate in the human body. Long-term adherence to a vegetarian diet may lead to iron deficiency [11]. Adolescents are in a critical growth period with high iron requirements; prolonged deficiency may cause anemia, thereby impairing normal brain function and leading to issues such as fatigue, anxiety, and depression. Therefore, a scientifically planned vegetarian diet must ensure nutritional balance.

5. Characteristics of the DASH Diet and Its Application in Adolescent Depression

5.1 Characteristics of the DASH Dietary Pattern

The Dietary Approaches to Stop Hypertension (DASH) diet emphasizes adequate consumption of fruits, vegetables, whole grains, and low-fat dairy products, along with appropriate intake of nuts and legumes. It restricts fats (particularly animal fats rich in saturated fatty acids), refined sugars, sugar-sweetened beverages, and sodium intake (below 2.3 g per day) [12]. The DASH diet provides abundant minerals such as potassium, magnesium, and calcium, as well as dietary fiber. Its nutritional profile is characterized by high calcium, high potassium, high magnesium, low sodium, low saturated fat, and low cholesterol.

5.2 Effects of the DASH Diet on Improving Adolescent Depression

A clinical study aimed to evaluate the relationship between adherence to the DASH dietary pattern and depression and aggressive behavior among Iranian adolescent girls (aged 12-18, n=535). The study utilized a 168-item Food Frequency Questionnaire to assess diet, the Beck Depression Inventory (BDI) and the Buss-Perry Aggression Questionnaire for psychological assessment. Multivariable logistic regression models controlled for confounders including age, energy intake, maternal occupation, passive smoking, menarche, parental death or divorce, physical activity level, and BMI. The results showed that high adherence to the DASH diet (highest quartile) was associated with a significantly reduced risk of depression (OR=0.47, 95% CI: 0.26–0.84, P=0.009), which remained significant after adjusting for multiple confounding factors. However, no significant association was found between the DASH diet and aggressive behavior. The researchers hypothesized that the anti-inflammatory and antioxidant components of the DASH diet (such as high levels of vitamin C, fiber, magnesium, and potassium) might confer protection against depression by reducing oxidative stress and inflammatory responses, with the improvement of metabolic syndrome also potentially serving as an intermediate mechanism. This study is the first cross-sectional investigation to explore the relationship between the DASH diet and psychological health in an adolescent population. Its strengths include rigorous quality control and multivariate adjustment, while limitations encompass the cross-sectional design preventing causal inference, and a sample limited to females with relatively small size [12]. Another relevant study indicated that adolescents who adhered to the DASH diet for an extended period had a lower likelihood of depression (OR 0.47; 95% CI 0.26-0.84, P-value = 0.009). However, research on the relationship between the two remains scarce, necessitating further prospective studies for confirmation.

Similar to the Mediterranean diet, the DASH diet emphasizes sufficient daily intake of vegetables and fruits, which are rich in vitamins and folate and possess antioxidant and anti-inflammatory effects that can mitigate free radical damage to the body. Furthermore, the phytochemicals in vegetables have actions that soothe cardiovascular function and enhance the contractile tension of smooth muscles. These nutritional components and physiological regulatory effects collectively operate on the body, effectively improving the emotional state of adolescents and thereby producing positive ameliorative effects on depressive symptoms in this population.

6. Conclusion

Adolescent depression is currently exhibiting an increasing trend, which not only severely impacts the physical and mental health and future development of adolescents but also imposes substantial economic burdens and psychological pressure on society, families, and individuals. The prevention and management of adolescent depression is by no means a simple medical issue; rather, it constitutes a complex systemic project involving multiple factors across physiological, psychological, and social domains. Consequently, there is an urgent need to transcend the traditional single-modality medical model predominantly reliant on pharmacological treatment and to establish a comprehensive intervention system that integrates

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multiple disciplines including medicine, psychology, pedagogy, and sociology.

Dietary patterns, akin to pharmacological treatments, can effectively ameliorate adolescent depression. Patterns such as the Mediterranean, vegetarian, and DASH diets contribute to these health benefits through underlying mechanisms including anti-inflammatory and antioxidant effects, and modulation of gut microbiota, all of which are closely linked to the pathophysiology of depression. However, the current application of different dietary patterns in adolescent depression still lacks high-quality evidence. There is a pressing need for further large-scale, long-term randomized controlled trials to elucidate the specific biological pathways involved.

Furthermore, the importance of dietary interventions warrants full recognition and high priority across multiple levels, including family upbringing, school education, clinical diagnosis and treatment, and public health policies. A concerted effort from all sectors of society is essential to collectively promote the widespread application and implementation of this cost-effective mental health promotion strategy, thereby assisting adolescents in navigating this critical life stage with a more positive and healthy state of being.

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