The Relationship Between Diet and Major Depressive Disorder

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Introduction:

Major depressive disorder (MDD), a common mental health illness, significantly limits and disables the quality of one's life (Malhi & Mann, 2018). Symptoms include loss of interest or pleasure, low energy, poor concertation, disrupted sleep or appetite, depressed mood, and feelings of guilt or shame (Ekmekcioglu, 2011). According to the World Health Organization (2020), over 250 million individuals suffer from major depressive disorder, and the lifetime risk hovers around 15-18%, which means one in five individuals will experience a major depressive episode at least once in their lives. Contributing factors to the onset of the disorder can include but are not limited to: social, cultural, psychological, economical, and biological factors.

Traditional treatment options for major depressive disorder consist of antidepressant medications and a wide range of psychotherapies. Significant evidence shows that when psychotherapy is combined with antidepressant medications, the plan of treatment has a higher success rate than single-modality treatments (Craighead and Dunlop, 2014). But only 25% of individuals with major depressive disorder receive antidepressant medications, and it is only successful 60-80% of the time (Khosravi et al., 2014). The remaining one-third of individuals are left to figure a treatment plan that works for them if there is one.

Individuals who experience treatment-resistant depression may benefit from complementary and alternative treatment options. While these alternative options may not have the power to treat depression alone, they could be usefully paired with traditional options. Some of these options include exercise, deep brain stimulation, ketamine, and dietary patterns (WHO, 2020). Several research studies have looked at the relationship between diet, inflammatory processes, and disease (Adjibade et al., 2017; Ekmekcioglu, 2011; Khosarvi et al., 2014; Shafiei et al., 2019; Tajik et al., 2015). The findings from these studies suggest that poor nutrition

choices impact the inflammation levels in the body and have shown to contribute to the development of major depressive disorder (Ekmekcioglu, 2011). But research has also demonstrated the positive impacts of an anti-inflammatory diet and healthy eating behaviors on depression (Khosravi et al., 2014). Although preliminary evidence supports a healthy diet and behavioral habits are beneficial for the prevention and treatment of depression, the relationship between a healthy diet and mental health is complicated and can go both ways.

This literature review will begin to look at past research that aims to understand the association between dietary habits and the prevention and treatment of depression. Limitations will be discussed, as well as the literature that grapples with the hypotheses of reverse causality to understand both sides of the debate. Finally, recommendations for future research will be provided based on the data and conclusions presented.

Inflammatory Response System in the Body:

Macrophages are critical immune cells in the body that work to maintain homeostasis by regulating neuroinflammation (Dey & Giblin, 2018). These cells detect stress in the body and then instigate an attack on the inflamed area to reduce damage. When this occurs, the body continuously produces an increased number of cytokines, a small protein that is responsible for synthesis, release, and reuptake of neurotransmitters that regulate the mood like serotonin, norepinephrine, and dopamine (Ekmekcioglu, 2011). The stimulation of cytokines leads to an activation of enzymes that breakdown and inhibit the normal body processes that produce serotonin and dopamine, which are thought to be two essential factors for mood regulation and the prevention of depression (Khalid et al., 2016).

Pro-inflammatory Diets vs. Anti-inflammatory Diets:

The typical western diet includes high amounts of refined grains, processed foods, fatty dairy products, sugary drinks, and fast food (Khalid, Williams, & Reynolds, 2016). Those who predominantly consume this type of diet trigger responses in the body to absorb glucose rapidly and, as a result, do not absorb the proper number of micronutrients, and omega-3-fatty acids and have elevated levels of pro-inflammatory cytokines in the body (Ekmekcioglu, 2011). To understand the impact of the western diet as a potential risk factor for developing depression, a study by Adjibade et al., (2017) looked at a group of 3523 French adults, who have never experienced depressive symptoms before, and their eating habits that signal inflammatory responses within the body. This population only represented middle-aged adults in a French community.

Researchers counted for confounding variables that were associated with inflammation and depressive symptoms like sex, age, physical activity, and smoking status. The findings suggest that men who consumed a more significant amount of inflammatory foods showed a higher risk of depressive symptoms over thirteen years (Adjibade et al., 2017). Depressive symptoms were even higher for individuals who smoked and were less physically active. These effects sizes (P-trend = .06) were not as significant compared to other studies but still showed the same trends. Additionally, evidence showed that lower depressive symptoms were associated with individuals who generally consumed healthy diets with low levels of inflammatory foods, like the Mediterranean diet. Finding from this study allow researchers to consider the possible impact of healthy diets compared to unhealthy diets and how the body responds to inflammatory foods.

Similarly, Khosarvi et al., (2015) conducted a case-control study to compare the benefits of a healthy diet to an unhealthy diet. An individual's food habits and frequency of food

consumption were recorded for a year and then analyzed. The information from the findings allowed the researchers to distinguish two major dietary patterns – healthy and unhealthy. Additionally, individuals who consumed a healthy diet reported lower symptoms of depression, most likely due to the increase of omega-3 fatty acids and other anti-inflammatory foods. As predicted, the evidence supported the overall hypothesis that an unhealthy diet was related to high symptoms of depression because responses from questionnaires regarding symptoms of depression and anxiety were higher than those in the control group (Khosarvi et al., 2015).

The Mediterranean diet is considered a healthy diet in which individuals consume vegetables, fruits, nuts and seeds, whole grains, dairy products, olive oil, fish, and fresh seafood (Shafiei et al., 2019). These foods contain a high level of B vitamins and omega-3-fatty acids, which work to decrease inflammation in the body and improve neural damage, which may be inhibiting mood regulation. Shafiei et al., (2019) reviewed past literature regarding the benefits of the Mediterranean diet on the risk of depression. The findings from nine cross-sectional studies showed a 28% decrease risk of depression with the consumption of foods from the Mediterranean diet. This indicates that the body not only responds to external stress but also internal stress that comes from food because of the elevated inflammatory markers that are present in unhealthy foods. Individuals who do not absorb the proper nutrients may lack essential vitamins that aid in maintaining mental health.

Dietary Patterns and Behaviors on Depressive Symptoms:

Skipping or missing meals is not uncommon behavior for individuals with busy lifestyles (Tajik et al., 2015). Parents of students may not have the time to make breakfast if they are working and trying to get their children to school. Around 20-30% of children in developing countries skip meals and, ultimately, increase stress in the body and the brain (Tajik et al., 2015).

Considering a the adolescent brain is still in a crucial stage of development, it is essential to note the various benefits a healthy and consistent diet can have on the mind (Khalid et al., 2016). According to Tajik et al., (2015), eating regularly timed meals increases the chance to maintain a steady routine and provides favorable nutrient intake for a growing child. Nutrient deficiency can lead to decreased performance in school and ultimately increases stress and depression among teens.

Tajik et al., (2015) investigated the association between unhealthy diet practices and stress and depression among children in Malaysia. Data collected from Eating Behavior Questionnaire allowed researchers to infer that missing meals and eating out at home are two other factors, above socioeconomic status, race, and gender, that were associated with stress and depression among the population of children. Specifically, skipping meals led to a low-quality diet and had an impact on young neural systems. These results were found from This study stresses the importance of eating three meals a day because of the benefits that come from the nutrient intake on daily performance, and later on the status of one's mental health. From these conclusions, education around nutrition is vital for families with developing children because the impact of food on their psychological state is so intense.

Similarly, Khalid et al., (2016) conducted a systematic review to understand the impact diet has on depression in children. Through evaluating 2014 studies in an observational cross-sectional study, the researchers found an apparent connection between a high-quality diet and a decreased risk of depression for children. The review also reinforced the idea of the importance of adequate nutrient intake. Specific nutrients like proteins, carbohydrates, biotin, vitamin B12, and more were consumed by children with lower levels of depressive symptoms.

Vitamin Deficiencies and Depression:

While individuals need to get a sufficient amount of all essential micronutrients and vitamins, some research suggests that some vitamins are more critical than others (Syed Mohammed et al., 2018). Narrowing in on Vitamin D, a fat-soluble, which is most widely known for its contribution to bone health, has also been seen to improve neurocognitive functioning (Syed Mohammed et al., 2018)Although the sun is an excellent source of Vitamin D, it is estimated around 1 billion people worldwide are deficient because of the lack of presence in common food groups. Syed Mohammed et al. (2018), looked to examine the correlation between Vitamin D deficiency and depression in university students from Saudi Arabia. Although the findings showed lower levels of participants with Vitamin D deficiencies, they also found that those with vitamin D deficiencies expressed higher levels of depressive symptoms. It is important to note that while Vitamin D may have neurological benefits, a deficiency does not mean depression is expected due to the number of possible confounding variables a student may possess like, stress from school and mental health history.

Limitations:

While all of these studies provide helpful information about the relationship between dietary habits and depression, there are some limitations to consider. Khalid et al., (2016) encountered issues with the cross-sectional research from their study because of the need for a large community. It would be hard to implement intervention diets for a wide range of people, so research suggests that focusing on at-risk populations would be a better way to determine the impact of diet on depressive symptoms. In the study that Khosravi et al., (2015), researchers decided to exclude individuals who possessed substance abuse issues due to the increase of inflammation in the body when it is exposed to alcohol. This exclusion could have introduced some bias to the findings and excluded a group that maybe even more prone to depression. It

would be necessary for future research to look at the impact of alcohol abuse, diet, and depression. Lastly, three studies focused on populations in developing countries (Khosravi et al.,2015; Tajik et al., 2015; Syed Mohammed et al., 2018). This contributes to the limitation of control because of contributing factors that do not allow for some countries to have the proper education around protective nutritional behaviors for developing children, money, or accesses to buy healthy foods, or their cultural values may not incorporate anti-inflammatory foods.

Reverse Causality in the Debate Against Diet and Depression:

On the other hand of this whole debate around food habits and depression, it is essential to note the way technological changes throughout society have changed the way individuals live their lives (Lopresti et al., 2013). Physical activity has decreased, sugar consumption has increased, and both of these issues are leading to physical and psychiatric health problems in many individuals. While the previous research maybe shows that dietary habits lead to the increase of depression, other studies note that contemporary lifestyles might be a much more significant factor in the development of depression (Lopresti et al., 2013).

Additionally, in a study by Jacka, Cherbin, Anstey, & Butterworth (2014), researchers hypothesized that the association between depression and diet might be due to reverse causality – a concept that relates X and Y in a way that is not typically expected. In this case, researchers are proposing depression influences dietary habits due to the symptoms like loss of appetite. The study consisted of a group of 343 Australian adults who have a history of depression. The controls consisted of current depressive episodes and other confounding variables. The findings showed evidence of reverse causality – those experiencing a current depressive episode had lower scores regarding healthy dietary patterns. But, those who once experience depression and sought treatment had higher scores of healthy nutritional habits.

Conclusion:

While the onset and course of treatment differ from person to person, the findings from these studies suggest that dietary patterns and depression have some relationship. Future studies should implement interventions for individuals with depression and work to control dietary habits and look at the treatment for depression from a smaller lens. Participants who are experiencing a depressive episode could follow an anti-inflammatory diet while participating in psychotherapy and antidepressant medication. Dietary habits may not have the power to treat everyone who experiences major depressive disorder. Still, food could have the potential to support those in recovery and decrease inflammation from an internal position. As stated previously, diet and depression are a bidirectional relationship. Still, with more research and awareness on the benefits of food, there could be a more concrete answer and understanding soon.

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