How are Micronutrient Deficiencies Associated with Outcomes of Postpartum Anxiety and Depression in Women?

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Introduction

Postpartum depression (PPD) is prevalent across the world, but a direct cause to this occurrence has not been identified. There has been a focus on research for treatment of PPD rather than on risk factors and prevention1. Postpartum depression is defined as depression occurring after child-birth, and up to a year, while antepartum depression occurs during pregnancy. There is a statistically significant amount of pregnant women becoming depressed, however, there has not been enough evidence to identify what one particular cause or treatment may be2. A systematic review of postpartum and antepartum depression studies showed that 21% of pregnant women reported being depressed either during or after pregnancy2. According to the Office on Women's Health, postpartum depression is possible for anyone including women without a previous history of depression: "For half of women diagnosed with PPD, this is their first episode of depression."3 One research article reveals the effect that PPD has shown on the quality of life for women diagnosed: there were lower levels of functioning in household care, increased risk for becoming homeless, and the increased risk of low-birth weight in the infant3. Over the previous decades, the link between the central nervous system and diet have been a large focus in scientific nutrition research on the brain. According to Brenda Leung in a systematic review published by the Journal of the Academy of Nutrition and Dietetics, research over diet and the brain's regulation of mood has been studied for over 90 years4. This may appear to be a long period of time to have learned about the nutrition-link to the brain but, there is still a lot more research needed in this vast topic to find answers. With Postpartum depression, there are still questions about screening for pregnancy-specific depression which could make measurement outcomes for PPD less defined because diagnostic tools are not standardized across different care. Some diagnostics for PPD can use the Center for Epidemiologic Studies Depression Scale, the Edinburgh post Depression scale, and several others3. Researchers have had to measure PPD symptoms based on the symptoms for general depression. However, many of the symptoms associated with general depression differ from those in postpartum/antepartum depression. The purpose of this review of literature is to determine whether micronutrient deficiencies are associated with outcomes of postpartum depression. This topic should be expanded on because the nutrition/brain studies are failing to be observed, and also, female-specific nutrition is relevant to such a large population. Women who have the potential to become pregnant are highly susceptible to malnutrition, especially malnutrition of nutrients theorized with depression/anxiety5. Because of this, it is important to determine whether there is a connection between the two. If evidence exists, depressed individuals could become less reliant on antidepressant medications, which have multiple side-effects like restlessness or anxiety6. Medical nutrition therapy with whole-foods could become a more common treatment.

Methodology

For results, research articles were searched in a database using specific keywords. Terms included in looking for resources were nutrition-related terms, paired with the phrases "Postpartum depression", "mental-health during pregnancy", and "maternal depression". There were also keywords not necessarily related to postpartum depression, but were relevant to show evidence that there is a connection between nutrition and the brain; These key phrases included "Gut-microbiome theory" and "nutrient deficiencies and mental health". There were several articles I found that were excluded, because they did not answer my research question; I did not include studies about cognitive function, since they related mostly to other target audiences: school-aged children with academic performance issues, and geriatric patients at a high risk for developing Alzheimer's. My thesis is about the association between nutrient deficiencies and postpartum depression. In order to find enough outcomes on this new and specific topic, my inclusion criteria was more vague than expected. In this review of literature, I have articles about general depression and studies about diet quality of people who suffer from postpartum depression.

Diet-Quality Studies

There were six research articles in this review that examined mental health during the antepartum and postpartum period and diet-quality1,4,9,10,11,12. Several diet-quality studies in this review determined the link between postpartum and antepartum depression based on their diet quality as compared to the HEI-2010. Most scores were extracted and compared to the 2010 data because studies that were published recently in the last five years were actually performed years before the publish date. Guidelines on Healthy Eating Index 2010 (HEI-2010) included intake of food groups like total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total foods with protein, seafood and plant proteins, fatty acids, refined grains, sodium, and empty calories. Other diet-quality guidelines established were more individualized to the research project (lower intake of processed fast foods, lower sugar intake, etc.) and varied greatly. Overall there were a standard set of nutrition guidelines that were consistent around most studies: the increase of nutrient-dense, high-fiber foods to decrease the intake of high-fat and high-sugar foods. Pregnant women with poor diet quality were not consuming all nutrients they needed for foods and were at higher risk for deficiency in these nutrients specific to maternal health. There were five studies observed that had at least one test for diet-quality effects on the brain. One of the most recent studies, in 2020, examined the link between perinatal depression and defined postpartum depression in participants if they met these two criteria: they scored a score of 10 or higher on the patient health questionnaire or they were on antidepressants between the time of their last menstrual cycle and their food frequency questionnaire11. Eighty-six percent of the recruited participants were eligible to be considered for postpartum/antepartum depression. The study showed the overall mean score of pregnant women taking the HEI in this RCT was 74.6 out of 100 which was above average. It did not see a decrease in postpartum depression symptoms with a better diet, however, there was a decrease in atypical depression symptoms (depression symptoms that can go away in response to other positive actions)11. Another literature review examined studies that included various interventions still aiming towards changing diet-quality: reducing body-weight, improving nutrition, or decreasing fat-intake. Of everyone of these three interventions, there was a positive correlation for reduction of depression symptoms12. With current results, there is enough evidence to support further expansion in research.

Component	Maximum point	Maximum score	Minimum score
Total fruit	5	≥0.8 cup/1,000 kcal	No fruit
Whole fruit	5	≥0.4 cup/1,000 kcal	No whole fruit
Total vegetables	5	≥1.1 cup/1,000 kcal	No vegetables
Greens and beans	5	≥ 0.2 cup/1,000 kcal	No dark green vegetables or beans and peas
Whole grain	10	≥1.5 Oz/1,000 kcal	No whole grains
Dairy	10	≥1.3 cup/1,000 kcal	No dairy
Total protein foods	5	≥2.5 Oz/1,000 kcal	No protein foods
Seafood and plant proteins	5	≥0.8 Oz/1,000 kcal	No seafood or plant proteins
Fatty acids	10	(PUFAs + MUFAs)/SFAs >2.5	(PUFAs + MUFAs)/SFAs ≤1.2
Refined grains	10	≤1.8 Oz/1,000 kcal	≥4.3 Oz/1,000 kcal
Sodium	10	≤1.1 g/1,000 kcal	≥2.0 g/1,000 kcal
Empty calories	20	≤19% of energy	≥50% of energy

PUFAs: Polyunsaturated fatty acids; MUFAs: Monounsaturated fatty acids; SFAs: Saturated fatty acids

Brain and Diet (Gut Microbiome Studies)

There were several experiments which explored theories of the connection between health of the gastrointestinal(GI) tract and the brain7. One experimental study intervened on a population of germ-free mice (mice with a completely clean gut) to generalize human connections to mammals. Germ-free mice were given an MRI to measure brain activity and dopamine release. As changes were made to the gut microbiomes, there was an effect on neurotransmission of the dopaminergic, noradrenergic/adrenergic, glutamatergic, and GABAergic nerves. Another notable finding from this line of research was that peptidoglycan, a component of bacteria found in the gut, that goes from the GI tract to the blood-brain barrier. There was also a stimulation of dopamine-releasing nerves with the reward of food after satiation. These two observations show that there was an interaction between the gut and the brain, and they could have the possibility of influencing each other7. This experimental research is the first piece of evidence in regards to how gut-health, which is managed by nutrition, can stimulate receptors in the brain. This allows researchers to ask the question whether postpartum depression is directly correlated to nutrition.

Specific Nutrient Deficiencies

When studying postpartum depression, it is necessary to understand the mechanisms behind the nutrients and identify the ones that are linked to mental health. Dietary reference intakes of certain vitamins are higher for pregnant or nursing women because they are used a lot in physiological processes for nourishing the baby[1,4,5]. As stated previously, women are at a greater risk for nutrient deficiencies which are vitamins A, D, E, C, folate, B12, B6, iron, zinc, iodine, copper, and selenium for optimum health of the mother and the fetus[5]. Vitamin A functions as a nutrient that participates in development of the embryo and cell differentiation. Vitamin A also contains retinoic acid which is present in several tissues in the body including the nervous system, heart, eyes, skeleton, respiratory system, ears, and the pancreas. It can be a factor behind changes to the organ structure because it is highly teratogenic[5]. Even though the research indicated that vitamin A (specifically retinoic acid) is vital in function of the nervous system, there were not any articles in this review that did a focus on vitamin A associations with mental disorders. Zinc also contributes to development of the baby, but in placental size, weight, and protein differentiations[5]. Zinc also had a positive correlation with improvement of depression in all of the studies it was featured in[1,4,13]. Vitamin D is needed for physiological functions during pregnancy. Vitamin D is essentially used for vascular endothelial growth factor of the placenta while maintaining the immune system health. One study finds research that vitamin D can improve mood for people with seasonal affective disorder[4]. Another literature review identified a statistically significant difference in the people protected from depressive symptoms when taking a vitamin D supplement, however, the meta-analysis reported a medium to high risk of bias. On the other hand, a factor not taken into account to the vitamin D report was that their exposure to sunlight was not considered even though a large amount of absorption accounts from that[1]. Another vitamin required at the beginning of pregnancy is vitamin E because it is used to form new blood vessels in creating the placenta[5]. Only one study found a depressive symptom benefit for pregnant women taking vitamin E supplements[4]. Vitamin C is important for immune support of both the mother and the baby but, only one study identified a small association with improved mood[5]. Folate is necessary for the creation of the offspring's DNA and to the cell division process. The other B vitamins involved in pregnancy, vitamins B12 and B6, are involved with fertilization of the baby by producing sex cells, creation of DNA nucleotides for cell division, and embryo development before sex cells implant. Folate and other B-vitamins are linked to brain function because they are also producers of certain neurotransmitters while also preventing neural tube defects[5]. Of the two studies that evaluated these B vitamins (vitamin B6, vitamin B12, and folate), one study observed the association between depression and deficiencies[4] and the other one did not find statistical evidence to support this theory[1]. Iron is involved in maintaining proper size of the placenta during pregnancy. Only one study examined Iron and found that iron had a positive relationship to reduction in symptoms of postpartum depression[4]. Selenium, zinc, and copper play a role in maternal health as well during pregnancy because they all play roles in developing the fetus[5] Selenium was studied twice and found a positive relation to reduction in depression symptoms[13] with one article and inconsistent findings for selenium in the next article[4]. The outcomes of nutrient-specific studies were sometimes inconsistent but had a few positive correlations with depression. This was enough to suggest further studies to identify any possible extraneous variables.

Conclusion and implications

This new line of research for how nutrition relates to depression is expanding the field for RDNs and will assist in their ability to help a larger array of people. Mental health disorders, like postpartum depression, can be effectively regulated and treated but there are not always certain cures or causes[14]. If researchers find enough evidence with the nutrition-link to the brain, this could lead professionals closer to understanding postpartum depression and other mental illnesses. The first piece of information to conclude from this review is that the experiment with germ-free animals does not completely represent humans but has a parallel relation. Studies stated that a statistically significant amount of women with postpartum depression had a poorer diet-quality compared to the ones that did not meet the criteria for postpartum depression. There was not an association with diet-quality and perinatal anxiety, however. In addition, there were inconsistent findings of results with specific nutrients involved in the studies, so there was not enough evidence to state that this is the main cause of postpartum depression. This was because there were not enough RCT's to test every specific nutrient enough to determine evidence because only one or no studies discovered that observed nutrients were relevant to postpartum depression. Another reason for the uncertain outcomes could be derived from an extraneous variable. There is still a lot of potential for this research because there are still unknown theories and findings about neurological connections to nutrients. With evidence from the gut microbiome theory and the positive correlations with diet-quality, there is a potential to find a link between nutrient deficiencies and postpartum depression. There needs to be more research for this topic to find more evidence. Even though these articles provided a thorough overview of nutrients in researchers' findings that connect to the brain, there is a need for more evidence and should be further studies made on this topic due to so much uncertainty still.

Works Cited

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