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Letter to the Editor

The influence of ketogenic diets on mood stability in bipolar disorder

Ketogenic diets have been known to be effective in the treatment of seizure disorder and weight loss (El-Mallakh and Paskitti, 2001; Bueno et al., 2013). Seizure disorders and bipolar disorders share similar treatment modalities (El-Mallakh and Paskitti, 2001) which lead us to inquire if ketogenic diet may be of benefit in bipolar disorders too. We reviewed the literature regarding possible mood stabilization effect of a ketogenic diet.

Ketogenic diets consist of high fat, low to moderate protein and low carbohydrates. Staple foods on a ketogenic diet include: meat, fish, butter, eggs, cheese, heavy cream, oils, nuts, avocados. Carbohydrate sources such as grains, rice, beans, potatoes, sweets, milk, cereals, fruits and some high carbohydrate vegetables are usually eliminated from the diet. This low carbohydrate, high fat diet causes the body to enter a metabolic state called ketosis by turning fat into ketones (Westman et al., 2003; Paoli et al., 2015). This diet causes formation of acetone and ketone bodies like beta hydroxybutrate which serves as the primary fuel source for the body and the brain. To attain a state of ketosis the diet is structured with a ratio of fat: protein: carbohydrates varying from 2:1:1 to 6:1:1 (El-Mallakh and Paskitti, 2001).

Multiple studies show that ketogenic diets are effective in the treatment of uncontrollable seizures in the pediatric population (Hassan et al., 1999; Vining, 1999; Batchelor et al., 1997). A study by Gilbert et al. (Gilbert et al., 1999) showed that a significant number of children following the ketogenic diet were able to discontinue anticonvulsants after 1 year. For adults, the studies are limited. However available published literature shows that 32% of adults treated with ketogenic diet achieved more than 50% reduction in seizures and a small percentage even achieved more than 90% reduction in seizure frequency (Klein et al., 2014).

In a study by James et al. (Phelps and S.V.S.a. R. S. E.-M., 2013), two women with a diagnosis of Bipolar Disorder were started on a ketogenic diet, and were able to maintain the diet for at least 2 years. Results showed that both women tolerated the diet well and achieved greater mood stability with the diet, than with the medications. Significant subjective improvement was noted in both patients with no observed adverse effects of the diet. In another case report (Yaroslavsky, 2002) a woman aged 49 years with a diagnosis of Bipolar Disorder refractory to mood stabilizers was started on a ketogenic diet. Despite good compliance to the dietary restrictions the patient was not able to achieve ketosis or its resultant benefits of weight loss or mood stability. In the first case report, both patients were able to discontinue mood stabilizing medications and remain stable with ketogenic diet as the only intervention. The second case study however could not yield positive results probably because the patient could not achieve a state of ketosis.

Altered neuronal excitability due to increased intracellular sodium levels secondary to an abnormality in the sodium pump is one of the possible factors in the pathophysiology of Bipolar disorders (Shaw, 1966). PET scan studies have shown reduction in glucose metabolism globally and in certain areas of the brain in affective disorders (Baxter et al., 1985). The three possible mechanisms by which ketogenic diet helps stabilize mood are: a) Seizure disorders and Bipolar disorders share similar treatment modalities. Lithium is known to be a good mood stabilizer and has mild anticonvulsant properties (Erwin et al., 1973; Shukla et al., 1988), while valproic acid and carbamazepine have good anticonvulsant effects and are also used as mood stabilizers (Ballenger and Post, 1980; Bowden et al., 1994; Lerer et al., 1987; Pope et al., 1991). These anticonvulsants reduce intracellular sodium by directly or indirectly acting on voltage dependent sodium channels theoretically contributing to mood stabilization (El-Mallakh and Huff, 2001). Similarly ketosis causes a state of acidosis by decreasing blood pH. It is postulated that to counteract this, extracellular protons are exchanged for intracellular sodium through the sodium-proton counter transport. This would be expected to have mood stabilizing effects. (El-Mallakh and Paskitti, 2001). b) The extracellular acidic environment created by ketogenic diet also helps in reducing neuronal excitability and excitatory neurotransmitters. c) Spectroscopic imaging studies show that ketogenic diet improves overall energy metabolism in the brain by changing the brain fuel source from glucose to ketones (El-Mallakh and Paskitti, 2001).

A major obstacle for achieving a state of ketosis is following a strict diet plan for an extended period of time which involves abstaining from carbohydrate rich resources especially simple sugars (Phelps and S.V.S.a. R. S. E.-M., 2013). Side effects of a ketogenic diet include (Kang et al., 2004): constipation, dehydration, elevated liver enzymes, hypertriglyceridemia, hyperuricemia, symptomatic hypoglycemia etc. Most of the complications were transient and could be managed with conservative measures (Kang et al., 2004). The side effects of ketogenic diet are dwarfed by those of anticonvulsant medications and lithium, including costly blood monitoring and other side effects.

Available literature suggests some benefit of ketogenic diet with mood stabilization if the diet is followed strictly. This letter aims to educate physicians about this diet and calls for more research on the effect it has on bipolar disorder as it could be a possible non-pharmacological adjunct mode of treatment in the future.

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