

## **Bipolar and Nutrition: The Ups and Downs**

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### **BIPOLAR AND NUTRITION: THE UPS AND DOWNS**

Bipolar disorder affects over five million Americans, which is over 2 percent of the general population (NIMH, 2011). Many times the occurrence of bipolar disorder results in the lack of ability to function on the job; employment rates of person's suffering from bipolar disorder is low (Michalak, Yatham, Maxwell, Hale, & Lam, 2007). The characteristic and symptoms of bipolar disorder differs from unipolar depression. Bipolar disorder can include psychosis, mood swings with depressive and manic episodes, and hypersomnia (Forty et al., 2008). Contrary to unipolar depression, impulsivity is also seen during depressive episodes as well as manic episode of bipolar disorder (Swann et al., 2007). The impulsivity can create difficulties with work, personal lives, and treatment. The uniqueness of bipolar disorder does not stop there, but also includes abnormalities within metabolic and enzymatic systems, eating disorders, weight control, health and nutritional issues, along with complicating treatment issues with medication and cyclic nature of the illness. Some of these metabolic and enzymatic abnormalities could have their beginning at the very beginning stages of brain development.

### **Gestational Nutrition**

Critical periods of neural and brain development takes place during prenatal and postnatal life development, optimal nutrition is essential during this time (Dauncey, 2009). Infants who are small for gestational age and preterm have several nutritional deficiencies; these deficiency and low birth weight are linked to changes in hypothalamic-pituitary-adrenal axis, and thyroid hormone (Dauncey). There is some research that links the vitamin and nutritional deficiencies of the mother during gestation with adult development of affective disorder, either unipolar or bipolar disorders (Brown, van Os, Driessen, Hoek, & Susser, 2000). Maternal nutrition affects the brain development of the child, which has shown to contribute to childhood developmental impairment; these children later in life tend to develop affective disorder (Brown et al., 2000). Maternal levels of n-3 fatty acids are linked to the child's IQ, along with infants who receive essential fatty acids and growth hormone through breast milk (Dauncey). The brain tissue is composed of lipids and fatty acids, some of which the body is unable to produce itself and must received from dietary sources (McNamara & Carlson, 2006). Gestational development of the brain requires maternal dietary supply for the essential fatty acid in brain development of the second and third trimesters (McNamara & Carlson, 2006). In the Brown et al study, they discovered evidence of affective disorder with gestational nutritional deficiency during the second trimester of pregnancy. Protein deficiency during prenatal development disrupts regions of the brain, such as the hippocampus, that are involved in neurotransmitter function, dopamine, and serotonin (Brown et al.).

### **Metabolism, Eating Patters, and Weight**

Metabolic issues that are apparent in sufferers of bipolar disorder include the metabolism of necessary proteins and other nutrients for brain function, energy storage, and health management.

Abnormalities of cellular metabolism and enzymatic systems of those suffering from bipolar disorder may result in compounding dysfunctions within the brain. Carnitine is essential

for the cellular transportation of long-chain fatty acids; impairment of this system affects adipose metabolism and oxidation rates (Steiber, Kerner, & Hoppel as cited in Doudney et al., 2009). The inability of the body to metabolize fat compounds for energy results in the lack of energy and an increased appetite to supply that energy. The C allele at the rs756606 gene may affect both storage and retention of fat (Doudney et al., 2009). Plasma free fatty acids were higher in patients with no C allele (GG genotype), and were able to loss fat mass. However, bipolar patients with one or two C alleles taking carnitine also lost fat mass. Another abnormality related to the storage of fat in bipolar patients is alterations in the hypothalamic-pituitary axis (Watson et al as cited in Doudney et al., 2009).

A metabolic abnormality found within the glutathione system has found to create issues for suffers of bipolar disorder. There is increased activity of glutathione s-transferase in the late stages of bipolar disorder, as well as increased activity of glutathione reductase; there is also indication of increased 3-nitrotyrosine in both early and late stages of mental illness (Andreazza et al., 2009). Glutathione peroxidase is used in the treatment of mental disorder and requires vitamin E, zinc (which is deficient in bipolar patients), carotenoids, cysteine, and selenium (Hedaya, 2010). Glutathione is a major component in managing oxidative stress on the brain, and usually depleted from those with bipolar disorder (Dean et al., 2009). For proper function of enzymes they need to be supported by the necessary nutrients, supplementation of vitamin E, zinc, carotenoids and other nutrients necessary in the function of glutathione will enhance the function of glutathione and reduce oxidative stress.

### **Oxidative Stress**

Research has indicated high levels of oxidative stress within the sufferers of bipolar disorder (Andreazza et al., 2009). This increase in oxidative stress may be linked to the increased metabolism of dopamine during manic episodes (Adreazza et al.). A meta-analysis of research conducted on bipolar disorder and oxidative stress revealed several abnormalities within the metabolic and enzymatic systems of those with bipolar disorder; these abnormalities increased oxidative stress damage (Andreazza et al., 2008). Oxidative stress results when either oxidation is high releasing large amounts of free-radicals or low availability of antioxidants for defense, or a combination of both (Andreazza et al., 2008). Increasing the availability of antioxidant agents through diet and supplements will assist in alleviating oxidative stress and damage.

The metabolic systems in the body are linked and create a cascading affect when one system is not properly working or is abnormal. Many of these enzymes within the metabolic system also rely on the available nutrients in the body to function properly. Abnormalities within genetics, glutathione system, hypothalamic-pituitary axis, along with the storage and transport of nutrients (such as long chain fatty acids), energy, and fat are either influence by, or itself influences, nutrition and weight of bipolar disorder patients.

### **Metabolic Disorder and Weight**

Patients with bipolar disorder and depressive disorder show HPA axis dysregulation which increases cortisol levels; increased cortisol levels is linked to the storage of fat in the abdomen which can also contribute to obesity (Maina et al., 2008). Metabolic syndrome had been found to complicate the treatment and issues of bipolar disorder; approximately thirty-eight percent of psychiatric patients suffer from metabolic syndrome (Bermudes, Keck, & Welge, 2006). Some interesting associations found in this study were the increase risk for metabolic syndrome in the patient's level of income, increased age, and Caucasian status. The identifiers for metabolic syndrome are high levels of waist circumference, fasting glucose, HDL-cholesterol and triglycerides (Poulin, et al, 2007).

Bipolar disorder patients who were obese indicated greater triglyceride levels and fasting glucose levels (Bond, Kauer-Sant'Anna, Lam, & Yatham, 2010). Weight issue is something bipolar patients have to battle on a daily basis either through the natural occurrence of the illness from metabolic abnormalities, or by the side-effects of medications. Bermudes et al. (2006) did not find indication of a relation between certain medications and metabolic syndrome (all participants were taking various medications for the illness); however it did find some association with other characteristics such as onset, severity, and duration of illness, along with body-mass index, triglycerides, and age. Within this study, older patients with later onset, longer duration, and increase severity of mental illness showed increased prevalence of metabolic syndrome over the general population. Another result of this study is the implications of binge eating relationship between bipolar disorder, obesity, and metabolic abnormalities.

The previous discussion concerning the abnormalities of the metabolic systems of bipolar disorder patients indicates the need to monitor eating habits, to maintain proper nutritional balance. With the abnormalities of the metabolic systems, even those who have good eating habits will tend to have difficulties with weight management. This is why the following issue of eating disorder complicates the issue of weight management even further.

### **Eating Disorders**

Another abnormality that was not previously discussed is the problems with the level of GABA (gamma-aminobutyric acid) and GABA neurotransmitter receptors. Reduction of GABA concentration has been linked to several issues related to mental disorders, one of which is binge eating (Arrúe et al., 2010; Broft et al., 2007). In the study conducted by Broft et al., (2007), they determined that binge eating could be reduced by a medication which stimulates the GABA neurotransmitter. Several other studies have also linked eating disorder with bipolar disorder; however the exact mechanism which stimulates binge eating and hindering the regulation of eating patterns is not completely determined.

McElroy et al. (2011) found that 125 out of 908 patients (14.3%) meet the criteria of an eating disorder. The most common eating disorder within this group of patients was binge eating (8.8%), followed by bulimia nervosa (4.8%), and lastly anorexia nervosa (3.1%). Schoofs et al. (2011) found that almost twenty-nine percent of the fifty-two women with bipolar disorder in their outpatient clinic fulfilled the criteria for binge-eating disorder. Similar results were found in Ramacciotti et al. (2005), showing fourteen out of fifty-one patients (28%) suffered from eating disorders (typically binge-eating or bulimia). Several studies have found patterns occurring with cycle and onset of eating disorder according to gender, menstruation, and onset of bipolar disorder.

For majority of patients (over half), the eating disorder began after the onset of bipolar disorder (McElroy et al., 2011; Ramacciotti et al., 2005). Conversely, McElroy et al. and Ramacciotti et al. studies differed in the percentage of patients with the simultaneous onset of bipolar and eating disorders, as well as the onset of bipolar disorder following the eating disorder. McElroy et al. found that ten percent of patients had simultaneous onset of eating and bipolar disorders; while Ramacciotti et al. found that twenty-nine percent of the patients' eating and bipolar disorders began around the same time. Fourteen percent of patients in Ramacciotti et al. study stated the eating disorder began after the onset of bipolar disorder; contrary to the thirty-four percent of patients in McElroy et al. study. Some patients remembered the eating disorder beginning during the manic state, while others remembered the eating disorder beginning during the depressive state (Ramacciotti et al.). From these studies, there is distinct correlation of the onset of the eating disorder with bipolar disorder.

Trends between gender and eating disorder were also seen within in these previous mentioned studies. Males with bipolar disorder tend to have more binge-eating issues over bulimia or anorexia (McElroy et al., 2011; Ramacciotti et al., 2005). All bulimia patients in the Ramacciotti et al. study were female, whereas eighty-five percent were female in the study conducted by McElroy et al. Interestingly enough, McElroy et al. discovered that females with bipolar disorder would also suffer from anorexia in the youngest group of patients; binge-eating was seen in the oldest group of patients. Not only can certain eating disorders be linked to gender, but females also indicate a cyclic nature of binge eating with their menstrual cycle.

Schoofs et al. (2011) discovered that binge eating episodes increased with frequency and severity the week prior to menstruation for female bipolar patients. This pattern was not only seen with patients diagnosed with binge-eating disorder, other bipolar patients not diagnosed with binge-eating disorder showed signs of more mild and controlled binge-eating episodes. Along with patterns of binge eating with menstrual cycle, Schoofs et al also discovered pattern with the depressive and manic states of bipolar episodes as previously mentioned in other studies. Majority of patients in the Schoofs et al study, whether diagnosed with binge-eating disorder or not, indicated increased frequency and intensity of binge eating episodes while in a depressive state. Only some participants indicated worse binge-eating episodes during a manic state; paradoxically there were a few patients which experienced binge eating episodes during the normal mood phases. Even though bipolar patients that were not diagnosed with binge-eating disorder also observed these trends, the binge eating episodes were mild and not severe enough to lead to excessive weight gain as seen in the bipolar patients diagnosed with binge-eating disorder. Characteristics of bipolar disorder, such as earlier onset of illness, greater number of episodes, rapid cycling, and higher rates of suicide are seen with increased rates of eating disorders (Schoofs et al., 2010).

During these binge eating episodes, patients indicated the craving and preferred consumption of sweet and fatty foods high in fat and carbohydrates, over foods high in fiber and protein (Schoofs et al., 2011). Rammacciotti et al. (2005) referenced several studies which indicated abnormalities in the serotonin system leading to carbohydrate cravings. Not only are poor eating habits observed during binge eating episodes, but poor eating habits are also seen within the general characteristics of the eating patterns of patients with bipolar disorder. Bipolar patients reported having fewer than three servings of fruits and vegetables each day, this lack healthy eating habits were compound with unhealthy sedentary lifestyle with very little exercise (Kilbourne et al., 2007). Some would also report other detrimental eating habits such as eating alone, only eating one meal a day, or difficulties in acquiring or fixing food (Kilbourne et al). As discussed above, weight gain in patients with bipolar disorder can be attributed to a sedentary lifestyle during depression, poor eating habits, eating disorders, and metabolic abnormalities. On top of these issues which complicate maintaining a healthy weight, doctors of bipolar patients were found to be less likely to discuss exercise and nutrition issue than with their schizophrenic patients (Kilbourne et al., 2007).

### **Medication Induced Weight Problems**

Not only are doctors not discussing exercise and nutrition, the medications prescribed for bipolar disorder has been linked to weight gain in several studies. In general, atypical antipsychotic medications show greater weight gain than typical antipsychotic medications or non-antipsychotic medications; whereas the combination of mood stabilizers with antipsychotics showed the greatest weight gain (Kim, Kim, Son, & Joo, 2008). Patients with bipolar disorder indicated lower resting energy expenditure than control groups, and a higher body-mass index

when treated with olanzapine for six months (Soreca et al., 2007). Olanzapine treatment showed greater weight gain than risperidone or quetiapine from the second-generation antipsychotic medications (Bond et al., 2010). When patients with bipolar disorder were hospitalized and treated for acute mania, the average weight gain of patients after four weeks increased on the average from five to ten pounds (Kim et al., 2008). At the time of admission in the Kim et al. study, twenty-four percent of bipolar patients were already obese. At the end of four weeks of medication treatment thirty-six percent were obese, seventeen percent overweight, and forty-five percent normal weight. However, almost four percent of the normal weight patients at admission were then obese after four weeks of treatment, and fifty-five of the overweight patients became obese.

Another study which looked at the weight gain of bipolar disorder patients with first time mania found similar results as the previous study over six and twelve month periods of treatment. In the study conducted by Bond et al. (2010), eighty-seven percent of patients were treated with mood stabilizers and antipsychotic medication. Throughout the study and treatment antipsychotic medication use dropped fifty percent at months six and twelve, while mood stabilizer use remained the same. There were no differences found in regards to body-mass index and rate of obesity between patients and healthy subjects at the time of enrollment. After six months of treatment however, forty-seven percent of bipolar disorder patients gained seven percent of their baseline weight, while healthy subjects only gained four percent of their baseline weight. At twelve months of treatment, nine percent of bipolar disorder patients as compared to four percent of healthy subjects gained fifteen percent of their baseline weight. Four percent of bipolar patients and no healthy individuals gained twenty-five percent of their baseline weight. As indicated in these percentages, bipolar patients gain a greater percentage of weight over control groups, with the bulk of the weight acquired mostly during the first six months of treatment.

As previously mentioned certain types of medications and combinations of medications indicated the greatest weight gain. Any medication combined with olanzapine showed the greatest weight gain, followed by medication combination with lithium; valproate monotherapy showed the least amount of weight gain (Kim et al, 2008). An anomaly in the Bond et al. (2010) study was the occurrence of a medication free bipolar disorder patient which showed extensive weight gain while not taking any medication treatment; this helps confirm the previous discussion of metabolic abnormalities of patients with bipolar disorder.

Although these studies indicate an increase of body-mass index and weight with medication, there are other studies which indicate bipolar disorder patients typically have mean body weight and body-mass indexes higher than other mental disorders such as obsessive-compulsive disorder (Maina et al., 2008). The bipolar patients in the Bond et al. study which compared bipolar disorder with obsessive-compulsive disorder were not on any medication, indicating that the greater weight and body-mass index could not be contributed to by medication side-effects. Behavioral and biological mechanisms are also major contributing factors to the weight of those suffering from bipolar disorder.

## **Nutrition**

### **Nutrition and Mood**

In a literature review conducted by Soh, Walter, Baur, and Collins (2009), they reviewed several articles which indicated the benefits of certain nutritional elements on mood and mood disorders. One such nutrient was the long chain fatty acids; several studies have noted an improvement on mood disorder symptoms with diets high in DHA and EPA (2000mg to

6000mg) (Soh et al., 2009). As previously indicated in this paper, DHA levels are typically low in patients with bipolar disorder.

Dietary protein can also influence mood and behavior by modifying tryptophan (Soh et al., 2009). Tryptophan is a precursor for serotonin; protein rich foods such as meat, fish, eggs, beans, and nuts (except for peanuts) are good sources (Harbottle & Schonfelder, 2008).

Micronutrients can affect mood, as will be discussed later, and an effective treatment for mood disorders. Various categories of vitamin B are shown to be beneficial. Several researches have indicated a link between thiamine deficiency and low mood (Soh et al., 2009). Psychiatric symptoms and depression can result from a deficiency in the vitamin B's niacin, folate, and B6 (Soh et al.). Concerns of increased oxidative stress and damage of those suffering from bipolar disorder were previously discussed; research studies have indicated the antioxidant power and benefit of vitamin E (Soh et al.). In some studies, gender differences were noted with self-reported mood changes when supplemented with riboflavin and B6; females reported an improvement in mood, while males did not (Soh et al.). However, this could be a result of an unreported deficiency at the time of the study in female participants. Other mineral deficiencies that have been indicated in depression are calcium, magnesium, and zinc (Soh et al.).

## **Deficiency**

Nutrient deficiencies as well as abnormal enzymatic and metabolic functions confound the issues with patients suffering from bipolar disorder. It is not completely determined if the deficiencies noted in patients with bipolar disorder are a result of marker of the disorder from long-term psychotic stress, or if the disorder is a result of the deficiency (Soh et al., 2009). Bipolar disorder patients showed lower levels of zinc and copper than healthier control individuals (Nourmohammadi, Ghaderi, Hydar, & Noormohammadi, 2007). As discussed earlier, zinc is necessary for the activity of glutathione system for management of oxidative stress in the brain. Another deficiency found in patients suffering from bipolar disorder, is the low levels of folate in blood serum typically found to be more dramatic during the depressive state compared to the manic state of bipolar disorder patients (Lerner et al., 2006). However, from this study these deficient levels could either be a result from the nature of bipolar disorder or medications used to treat bipolar disorder.

Other nutrients low in the plasma of bipolar patients is tryptophan and kynurenic acid concentrations; these deficiencies were observed during the manic phase of bipolar patients (Myint et al., 2007). After treatment with valproate sodium, lithium, or antipsychotic medications, the tryptophan breakdown increased which indicated tryptophan metabolism either to serotonin or movement to the kynurenin pathway (Myint et al., 2007).

Some nutrient deficiencies are significant in the formation, storage, and transportation of various cellular components. An increase in the rate of phospholipid change as a result of the increase activity of calcium dependent phospholipase is contributed by the regulation of intracellular calcium ion storage and mediation of signals (Ross, Hughes, Kish, & Warsh, 2006). As indicated by the name, calcium is essential in the functioning of the phospholipase and the changes in phospholipid. There is a suggested abnormality in phospholipid metabolism with bipolar disorder in which omega-3 fatty acids can be incorporated into membrane phospholipids, as well as fatty acid influence in the reduction of cytokines. Even though there is not a concrete conclusion on the result of omega-3 oils on the improvement of depression and bipolar disorder, there have been studies which indicated a significant improvement with symptoms; eating fish at least twice a week is recommended, and for vegan diets flaxseed can be used (Bodnar & Wisner,

2005; Harbottle & Schonfelder, 2008; Soh, Walter, Baur, & Collins, 2009; Tsalamanios, Tanni, Koutsari, 2006).

## **Health**

Research has indicated abnormalities in glucose metabolism increases patients with bipolar disorder probability of developing diabetes; some medications can exacerbate this issue (Chue, & Cheung, 2006). Components of poor general health are more evident in patients with bipolar disorder. In one study bipolar disorder patients indicated lower DHA (docosahexaenoic) compared to controls, along with greater vaccenic acid and oleic acid (McNamara et al., 2010). Along with lower DHA in this study, bipolar patients indicated a lower EPA(eicosapentaenoic acid)+DHA composition; yet a greater AA:DHA, AA:EPA+DHA, and n-6/n-3 ratios. The erythrocyte EPA+DHA composition of major depressive disorder and bipolar disorder patients is similar to those suffering from acute coronary syndrome, and at a higher risk for sudden cardiac death (Block et al as cited by McNamara et al., 2010). Nevertheless, DHA composition did not correlate to severity of depression and mania symptoms, or age in the McNamara et al study. Results of this study indicate the deficit of DHA may be compounded by peroxisome function defect; affective treatment would be the preformed DHA rather than pre-peroxisome precursors.

Bipolar patients showed lower serum HDL-C values and higher triglyceride values than control groups (Sagud et al., 2009). Higher cholesterol/HDL and LDL/HDL ratios were also found in patients with bipolar disorder, with the depressive state indicating higher cholesterol/HDL ratio than manic state (Sagud et al., 2009). These health issues position bipolar disorder patients and a greater risk for cardiovascular disorders, and diabetes.

## **Care Management**

Several different aspects are important in considering the management and care of bipolar disorder patients. The complexity of the disorder creates a need for complex care. Most treatment and management is in conjunction with either mood stabilizers or antipsychotic medications. A study which included treating juvenile bipolar disorder patients with 360 mg of EPA and 1560 mg of DHA for six weeks in conjunction with their mood stabilizer or other medications indicated lower levels of mania and depression, as well as higher global functioning skills (Clayton et al., 2009). Parents of the juvenile patients also reported fewer internalizing and externalizing behaviors. This improvement may be attributed by the fluidity of the phospholipid membrane which is stimulated by the EPA and DHA, ultimately affecting the neurotransmitter receptors (Clayton et al., 2009).

Other additives to include in the treatment for bipolar disorder along with medication treatment for greater improvement of the patient's wellbeing are folic acid (Behzadi et al., 2009; Lerner et al., 2006), zinc (Nourmohammadi et al., 2007), and tryptophan (Myint et al., 2007), as well as vitamin E and carotenoids (Hedaya, 2010). A case study conducted by Rucklidge and Harrison (2010) looked at the use of micronutrient formula for the management of multiple mental and emotional disorders of an individual. The micronutrient contained sixteen minerals, fourteen vitamins, three amino acids, and three antioxidants (Frazier, Fristad, Arnold, 2009). The person in this case study was diagnosed with several disorders including ADHD, hypomania, depression, oppositional defiant disorder and learning disabilities throughout her life; medication did not bring relief from these symptoms for the patient (Rucklidge & Harrison, 2010). Prior to the use of the EMP+ micronutrient formula in this study, the participant went off of all psychiatric medications. After eight weeks of the micronutrient formula, the participant's

depression was reduced, and emotional stability with hyperactivity and impulsivity improved. The participant discontinued use of the micronutrient under the impression that the symptoms improved because of other reasons over the micronutrients formula. Once the discontinued use of the formula, the participant's symptoms began to return after two weeks, and continued to increase in severity until reaching the original baseline level after two months. Upon reintroducing the micronutrient to the treatment of this patient, the symptoms began to diminish once again. Another case study of a fourteen year old boy showed similar and drastic results as described above (Frazier, Fristad, & Arnold, 2009). Small doses of vitamins and nutrients showed minimal relief of symptoms, while very large doses of vitamins, minerals, amino acids, and antioxidants were able to replace all psychotropic medication (Frazier et al., 2009).

Several management strategies are geared toward weight management of bipolar disorder patients. Programs which include education to improve understanding of the role of nutrition and exercise on risk factor prevention, along with modifying diet and exercise are essential for the longevity of maintaining a healthy lifestyle (Poulin et al., 2007). Bipolar disorder patients who are involved in an exercise program with cardiovascular training and strength training reduce their body-mass index, waist circumference, and bodyweight; while these factors are seen to increase with non-active control groups (Pouline et al). Other improved health factors observed in this study of the active group of bipolar disorder patients involved in the exercise program receiving medication treatment are an increase in HDL, while decreasing LDL, triglycerides, total cholesterol, and fasting glucose. The identifiers for metabolic syndrome of waist circumference, triglyceride and HDL levels, and fasting glucose were all decreased in the active group of the study. This decrease in cardiovascular risk was approximately seventy-five percent for this group. Both the bipolar disorder control group and the bipolar disorder active group improved their psychological scores, while the active group also improved their health. (Poulin et al.)

Suto et al. (2010) conducted a survey of patients who were well established with their management of bipolar disorder to determine their perception of quality of life. Within the data, six domains emerged: "1. Sleep, rest, exercise, and diet; 2. Ongoing monitoring; 3. Enacting a plan; 4. Reflective meditative practices; 5. Understanding bipolar disorder and educating other; 6. Connecting with others." (p. 78) Participants stated knowing their limits with commitments and avoiding getting overwhelmed was essential for their wellbeing. Sufficient regular sleep, typically eight to nine hours, was considered vital to wellness by the bipolar disorder participants. Along with sleep, regular periods of mental and physical rest were considered to help with reenergizing and maintaining balance during the day. Some participant equated mania and depression with irregular sleep and rest.

Participants who suffer from bipolar disorder in the Suto et al (2010) study also placed great importance on exercise, but not just any exercise, finding the right exercise that matched their needs as essential. Some of these activities included Tai Chi, dance, swimming, walking, exercise routines, snowboarding, and yoga. Simply the environment of which some of these activities took place was as therapeutic as the activity itself; activities in nature such, as walking or exercising, were considered therapeutic in on their own.

Healthy diet and nutrition, and the avoidance of mood altering foods and substances, such as caffeine, sugar, alcohol, and drugs, are vital to management and wellbeing. Management strategies of participants also included eating healthy regularly scheduled meals, along with vitamin supplements. Erratic eating patterns were seen with changes in moods; scheduled meals



and supplements help maintain balance and control moods. Awareness of the changes in mood and eating patterns is important in maintaining balance and staying in control. (Suto et al., 2010)

Close monitoring of mood and activities can assist with the ability to predict an episode through either physiological signs or activity patterns (Suto et al., 2010). One participant indicated that the number of items on the to-do-list is a major indicator; understanding their individual unique patterns are important. This ability is typically found in those who have lived with bipolar disorder for several years over those just recently diagnosed. Having a drafted plan of action ready prior to the occurrence of an episode can be implemented at the first sign of an impending episode by family and friends (as well as the individual) (Suto et al.). Spouses and loved ones can assist with identification of warning signs of mania and depression, as well as assist with the implementation of the action plan. Part of the action plan may include adjustment of medication, sleep, or activity level; making the adjustments with the predicting signs prior to the onset of the episode is important (Suto et al.).

## **Conclusion**

Bipolar disorder is a complex mood disorder encompassing aspects of genetic and metabolic abnormalities, eating disorders, health, nutrition, as well as the compounding issues of medication induced side effects. If metabolic and enzymatic systems are not functioning properly, then treatment to improve function and proper nutrition, along with the addition of deficient nutrients are of even more importance. The psychosis of bipolar disorder has been linked to various nutritional deficiencies. The first line of treatment should be a complete evaluation of possible nutritional deficiencies, along with testing for metabolic and genetic abnormalities. Once the baseline has been established, then close monitoring of treatment should be utilized. Recommendation to start with high doses of micronutrients prior to the administration of psychiatric medications which induce weight gain would be beneficial to the bipolar patient in various health aspects. Morbidity and mortality rates are high with those suffering from bipolar disorder. These rates could be lowered by maintaining healthy lifestyles and weight. With proper nutrition, exercise, and corrective metabolic measures, the risks for cardiovascular disorders and diabetes can be reduced.

Educating the bipolar patient on the risks involved with bipolar disorder is essential in the management of the symptoms and disorder. Bipolar patients that are aware of the links between nutrition and activity will be more likely to adhere and follow through with treatment. Assisting patients and their family members with predicting impending episodes, in conjunction with making necessary adjustments, will enhance their ability to function.

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