

# Eating disorder: influences of hormones and vitamins

## Abstract

Eating disorder (ED) is one of the major health concerns in global perspectives. This disorder includes Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, orthorexia, diabulimia and 'Other Specified Feeding or Eating Disorder'. There are psychological and psychiatric components involved with this disorder. Hormones and nutritional factors are also associated with ED. The treatment approach depends on the specific form of ED as well as severity of the illness including co-morbidity. Pharmacotherapy and Psychotherapy both play roles in the treatment strategy of ED. This review will look into different adjunct options of specific agents like hormones and vitamins for the successful management of ED.

**Keywords:** eating disorder, anorexia nervosa, bulimia nervosa, binge eating disorder, psychotherapy, hormones, vitamins

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## Introduction

Eating Disorder (ED)-a disease hidden inside many people is one of the major health concerns around the world. Although eating disorder (ED) is related with eating habits, there is psychological and psychiatric components associated with it. Severe disturbances in the perception of body weight and shape have been observed in ED patients.<sup>1</sup> High prevalence of comorbidity has been observed between eating disorder and schizophrenia. Patients can develop psychotic symptoms together with eating disorder.<sup>2,3</sup> It has been found from WHO World Mental Health (WMH) data that life time prevalence of Bulimia Nervosa (BN) and Binge Eating Disorder (BED) were 1.0% and 1.9% respectively across the surveys. About 85% respondents with life time Bulimia nervosa (BN) and 79.0% with life time Binge eating disorder (BED) exhibit comorbidity with other mental disorders.<sup>4</sup> Collaborative psychiatric epidemiological surveys revealed that prevalence of premenstrual dysphoric disorder was 17.4% and 10.7% among those suffering from BN and BED respectively.<sup>5</sup> In a German national school based survey, the authors found that prevalence of full syndrome of Anorexia Nervosa (AN), BN and BED was 0.3%, 0.4% and 0.5% respectively.<sup>6</sup> Another recent study on female university students in Malaysia revealed that body image and depression contribute to eating disorders.<sup>7</sup> Significant development have been seen in the field of psychological therapies for eating disorder. However, these developments offer both possibilities and challenges.<sup>8</sup>

In many cases, people even do not know that they are suffering from this ED. This disorder can be fatal as well. Psychological disorders include abnormal or disturbed eating habits, life threatening extreme eating behaviours and depression.<sup>9</sup> It has been found that parenteral warmth, monitoring and interaction with the boys was not related to eating disorder. However, low parenteral warmth alone was associated with bulimic behaviours in girls.<sup>10</sup>

Among AN, BN and BED, AN is associated with low food intake. In BN abnormally high food intake and afterwards purging are seen by the patients. BED is associated with loss in controlling large food intake. Other types of eating disorder include 'Orthorexia', 'Diabulimia', 'Other Specified Feeding or Eating Disorder' (OSFED) and some additional eating or feeding disorders. It has been demonstrated from a prospective study that a high proportion of boys were affected

by early onset eating disorder (EOED). Significant psychological comorbidity and high frequency of hospitalization were associated with EOEDs.<sup>11</sup> Several reasons are identified to be associated with ED such as stress, vitamins, hormones, memory impairment.<sup>12,13</sup> AN is a psychic disorder in which people are extremely worried of gaining weight, whereas they actually are under-weight. Because of this fear they not only tend to eat abnormally less, but also try over-exercise. Sometimes they themselves attempt to induce vomit, takes diuretic drugs, laxatives for losing weight. It is a common form of malnutrition with an average risk of mortality of 20% in young population.<sup>14</sup> As the patients have severe disturbances about their body weight and shape, they check body-images in the mirror and measure their body weights over and over.<sup>1</sup> Mortality rate is higher in patients with AN and a psychiatric comorbidity compared to those without a comorbidity.<sup>15</sup>

As the ED is a psychiatric disorder different therapeutic and psychological approaches should be involved in the treatment.<sup>16</sup> The treatment of anorexia nervosa is difficult and no treatment is supported by robust indication. According to NHS, UK, the psychotherapy for treating AN principally includes cognitive analytic therapy (CAT), cognitive behavior therapy (CBT), interpersonal therapy (IPT), focal psychodynamic therapy (FPT) as well as family interventions.<sup>17</sup> It was found that cognitive behavior therapy was more effective compared to the nutritional therapy.<sup>18</sup> "Enhanced" cognitive behavior therapy was offered to each patient over 40 weeks. There was no concurrent treatment during that period. A substantial increase in weight and BMI was observed along with markedly improved eating disorder features in those patients.<sup>19</sup> Family based treatment was found significantly superior to adolescent-focused individual for the adolescent with AN.<sup>20</sup> Nevertheless, if medication is required, antidepressants such as different Tricyclic Anti-depressants (TCAs), Selective Serotonin Reuptake Inhibitors (SSRIs) are the most common choices.<sup>17</sup>

BN is another life-threatening eating disorder in which people take a large amount of food within a very short time. After taking large amount they try to compensate it by purging either by doing over-exercise or vomiting or taking laxatives. The patients also develop some psychological problems such as anxiety, depression, electrolytes imbalance as well as some gastrointestinal problems.<sup>21</sup> BN is extremely harmful in pregnancy. Pregnant women can lead to infertility, miscarriage, polycystic ovarian syndrome and other birth problems in AN and BN.<sup>22</sup> It has been shown that thyroxin levels in

pregnancy with BN and AN are positively correlated with reduced head circumference of fetus.<sup>23</sup> Particular antidepressant SSRIs In adolescent, family based treatment (FBT) offered immediate benefit in BN when compared to cognitive-behavioural therapy (CBT). However, FBT was not statistically superior to CBT.<sup>24</sup> Fluoxetine, a selective serotonin reuptake inhibitors (SSRIs) is the drug used for the treatment of BN.<sup>25,26</sup> This drug is also reasonable to include in children and adolescents suffering from BN.<sup>25</sup>

BED is discussed as a central feature of bulimia nervosa rather than an individual eating disorder.<sup>27</sup> Now, it is being taken in serious consideration due to its widespread occurrence. BED is the most prevalent eating disorder in USA and it is now discussed distinctly in the Diagnostic and Statistics of Mental Disorders.<sup>28,29</sup> People suffering from BED are often depressed and ashamed of their binge eating and feel stressed. They tend to hide this habit from their friends and family and often eat alone until they cannot eat anymore.<sup>30</sup> Researchers are trying to unearth the exact cause of BED but they are not yet so sure about the main contributors to this eating abnormality. Factors like depression, dieting, emotional disturbance, neurological chemicals, and even genes can take part in causing BED.<sup>30</sup> Binge eating can indirectly contribute to the risk of hypertension, type 2 diabetes, high blood cholesterol level, cancer etc as they are highly associated with the weight gain.<sup>31</sup> Treatment of BED includes psychotherapy, pharmacological therapy or a combination of both. Nutritional replacement approach can contribute to reduce the body weight which is expected to lower other symptoms of BED as well.<sup>32</sup> The medications again include three distinct classes: antidepressants, appetite depressants and anticonvulsants. They can be used in combinations or alone. Selective serotonin reuptake inhibitors (SSRIs) are the most commonly prescribed antidepressants in the treatment of BED is fluoxetine.<sup>25</sup> Lisdexamfetamine dimesylate is recently approved drug by US-FDA to be used in the management of BED in adults.<sup>33</sup>

Adverse reactions in patients with ED receiving antidepressants include nausea, dizziness, sedation, fatigue insomnia, dry mouth, constipation, palpitations, sexual dysfunction, tremors and increases in pulse rate, declining systolic and diastolic blood pressures and orthostatic hypotension. With antidepressants weight gain can occur and may pose a problem with those who have a fear of weight gain. Word finding difficulties, difficulty with concentration and paresthesias have been reported with topiramate treatment of BN patients.<sup>25</sup> Although there are some side effects of pharmacotherapy, they still have roles in the management in patients with ED who are inadequately responsive to psychotherapy.<sup>34</sup>

Orthorexia nervosa (ON) is an eating disorder in which patient is obsessed about pure food. It is undoubtedly healthy to have biologically pure food, but misconception or fixation about purity leads to orthorexia nervosa. Patients suffering from this type of eating disorder exclude various food materials from their daily dietary list assuming that they are impure to eat. They restrict their food alternatives by considering that those alternatives contain artificial fertilizer, insecticides etc. which are harmful for their health.<sup>35</sup>

Treatment of orthorexia is a combined work for the physicians, psychiatrists and dieticians.<sup>36</sup> In extreme conditions, antipsychotic drugs like olanzapine may be prescribed. Some professionals suggest for a residential treatment which is aimed to eradicate the unhealthy relationship with the healthy foods.<sup>37</sup> Diabulimia summation of diabetes and bulimia, is a type of eating disorder. It is seen in type 1 diabetes patients. Diabetic patients who are very much concerned about their weight gain, tend to reduce their weight by limiting

their insulin administration. This type of disorder is associated with impaired metabolic control, frequent episodes of ketoacidosis, early onset of micro vascular complications. Treatment of diabetes, management of nutrition and psychological therapy are necessary for these patients. A multidisciplinary team consisting endocrinologist, nutritionist, psychologist, psychiatrist and other health professionals is required for its management.<sup>38</sup> There are some eating disorders which are different from the disorders specified above. These eating abnormalities were termed as Eating Disorder Not Otherwise Specified (EDNOS) in DSM-IV. However, in DSM-V it is renamed Other Specified Feeding and Eating Disorder (OSFED).<sup>39</sup> OSFED causes some serious impairments to the patient but its signs and symptoms are different from other disorders like anorexia nervosa (AN), bulimia nervosa (BN), binge-eating disorder (BED) and orthorexia etc. The signs and symptoms of the atypical anorexia nervosa patients meet all the criteria except weight loss. Individuals hardly lose their weight and there is a less chance to develop binge eating.<sup>40</sup> Night eating syndrome (NES) is demonstrated by food intake in the evening. Insomnia, morning anorexia and depressed mood are also included in NES. A positive association exists between NES and BMI.<sup>41</sup>

## Materials and methods

### Role of hormones and vitamins in Eating Disorder

**Stress and Eating disorders:** Eating behavior is complex and multifaceted. Stress reactivity, both psychological and physiological, may distinguish over eater from under eater. Person having eating disorder, shows difficulty and coping with their emotions. Difficulties in regulating and coping can create a greater vulnerability to stressful life events that have been associated with the commencement of eating disorder.<sup>42</sup>

**Hormones in stress and its relation to eating disorder:** Level of various hormones changes, in response to stressed situation. Mental stress leads to chronic activation of the neuroendocrine systems. Reactions to stress are associated with enhanced secretion of a number of hormones including cortisol, glucocorticoids, catecholamines, growth hormone and prolactin, the effect of which is to increase mobilization of energy sources and adapt the individual to eating disorders.<sup>43,44</sup> Cortisol is the main hormone involved in appetite regulation and energy balance by increasing available energy through gluconeogenesis and lipolysis.<sup>45,46</sup> In animals, glucocorticoid administration and corticosterone replacement led to hyperphagia and weight gain.<sup>47</sup> Overeating of 'comfort foods' in humans may be stimulated by cortisol in response to stress, which can result in eating behavior.<sup>48</sup> Cortisol favors central fat deposition which causes a decrease in the adipostatic signal and an increase in the orexigenic signal. As a result appetite and food intake increase. This phenomenon contributes to the current epidemic of obesity.<sup>44</sup>

Ghrelin is another hormone produced by ghrelinergic cells in the gastrointestinal tract, which functions as a neuropeptide in the central nervous system. Besides regulating appetite, ghrelin also plays a significant role in regulating the distribution and rate of use of energy.<sup>49,50</sup> When the stomach is empty, ghrelin is secreted. When the stomach is stretched, secretion stops. It acts on hypothalamic brain cells both to increase hunger, and to increase gastric acid secretion and gastrointestinal motility to prepare the body for food intake.<sup>51,52</sup>

Leptin another important hormone made by adipose cells helps to regulate energy balance by inhibiting hunger. It is opposed by the actions of ghrelin. Both Leptin and Ghrelin act on receptors in the

arcuate nucleus of the hypothalamus to regulate appetite to achieve energy homeostasis. In AN and BN, a decreased sensitivity to leptin occurs, resulting in an inability to detect satiety despite high energy stores.<sup>53,54</sup>

Alterations in brain serotonin (5-hydroxytryptamine [5-HT]) function are also thought to contribute to diverse aspects of eating disorders, including binge eating, perfectionism and impulsivity of eating. It also contributes to mood-regulation. Beside this, 5-HT anomalies in individuals with eating disorders are believed to have multiple determinants associated with secondary effects of their nutritional status, hereditary effects and, possibly, long-term neurobiological sequelae of developmental stressors.<sup>55,56</sup>

**Role of vitamins in Stress and eating disorder:** Water soluble vitamins like vitamin B complex & vitamin C are more prone to washout from the body during stress. Because in stressed condition brain utilize more and more water soluble vitamins to produce energy. Therefore, body suffers from these vitamins in stress conditions.<sup>57,58</sup> However, fat soluble vitamins do not response much in mental or physical stress. Several studies suggested that there is little or no relation between vitamin A deficiency and eating disorder. For vitamin E the statement is also true. It has been shown that eating disorder patients have higher plasma concentration of vitamins A and E. It is because in many eating disorder patients, especially women, the cholesterol concentration is found high compared to the normal individual. Therefore, fat soluble vitamins deposition is elevated. A significant correlation has also been observed between plasma cholesterol and both vitamins (A and E) concentrations.<sup>59,60</sup>

Status of Vitamin B-6 gathers particular interest in patients with eating disorders. Vitamin B-6 is a coenzyme for 5-hydroxytryptophan decarboxylase, an enzyme involved in the serotonin biosynthetic pathway. Serotonin appears to be involved in the control of appetite and it was suggested that drugs that increase central nervous system serotonergic activity are effective for treating BN. It is possible that the chaotic eating of women with eating disorders may result from, or be worsened by, vitamin B-6 deficiency.<sup>61,62</sup>

Several studies have observed that serum vitamin D levels is within the normal range among AN patients or it may even higher when compared with controls.<sup>12,63</sup> The reason for this is not fully understood. However, it may be a result of higher vit D supplementation among patients with AN and/or changes in metabolic clearance and storage of this vitamin in adipose tissue.<sup>64</sup>

## Conclusion

Eating disorder (ED) is a major health concern causing severe disturbances to eating habits. It involves patients with co-morbid psychological and psychiatric disorders where psychotherapy plays a major role. ED is also greatly influenced by hormones and nutritional factors. Despite of some side effects pharmacotherapy has a role in the management of eating disorder, especially in those patients who are inadequately responsive to psychotherapy. There is inadequate evidence of the availability of successful pharmacotherapy alone or combination with psychotherapy for ED in the literature. Therefore, further study is needed to clarify which specific (hormones, vitamins or psychotherapy) agents might be most useful for treating patient, as well as to delineate the larger role of combination treatment (psychotherapy and pharmacotherapy) in relationship to the management of ED.

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## Conflict of interest

The author declares no conflict of interest.

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