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Review Article

An update on Bulimia Nervosa and its Management

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Abstract:

Bulimia Nervosa is an eating disorder where a patient indulges in binging and purging. Various psy-chological treatments are available like Cognitive Behavior Theory (CBT) and Interpersonal psycho-therapy which focusses on combating the negative thoughts to prevent destructive habit. Pharmacolog-ical treatments like consuming antidepressants like selective serotonin reuptake inhibitors (SSRIs) play a major role in eating disorder (ED) therapy. Bulimia Nervosa and its effects on the body can be main-tained by increasing the serotonin levels. Serotonin level can be increased by increasing tryptophan, folic acid, omega-3 fatty acids, electrolytes like potassium, magnesium etc in the body. Pharmacologi-cal treatment may have its own side effects in the body like dizziness, agitation, insomnia etc. Thus, various natural ingredients and herbs can be used like soybean, turmeric, whole grains, ginseng etc for the management of Bulimia Nervosa (BN). Introducing nano foods using nanotechnology and adding polyphenols for managing BN can be a new scope for the food industry as well as the nutraceutical industry.

Key words: food; health; eating; disorder; phytochemicals; spices; herbs

Introduction

Eating and anxiety disorders are highly correlated. Anxiety disorders antecede eating disorders leading to a notion that early onsets of anxiety prompt individuals to eating disorders (Swinbourne and Touyz, 2007). An eating disorder (ED) is a psychological disorder where the patient experiences various disturbances in his eating habits. Eating disorders can be classified into three main categories: Anorexia Nervosa, Bulimia Nervosa, Binge eating disorder (Herrin and Larkin, 2013). The major cause of ED can be the cultural foundations or the social-cultural attitude, i.e., the body image profound in women (Garner et al., 1980). Mostly seen in the western countries, women are pressurised and emotionally tortured about their weight. ED usually occurs in women, as a concern of self-pity, exterior appearance and perfectionism (Brown et al., 2012).

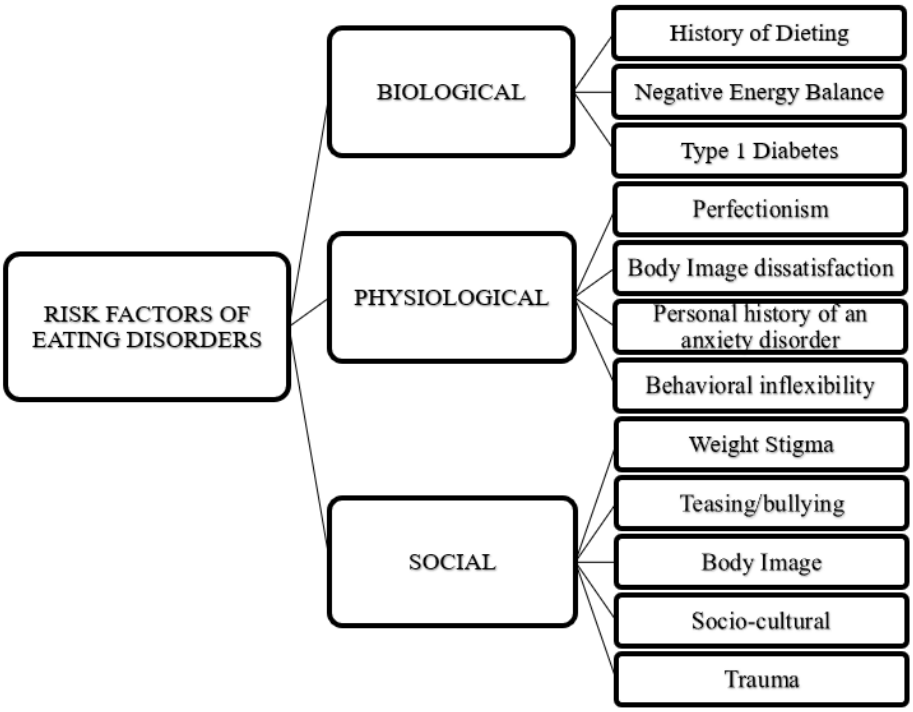


Figure 1: Risk Factors of Eating Disorders

The lifetime prevalence of Bulimia in Women is between 0.9 to 2.1% whereas for men it is <.1% Patients try to control their weight and restrict weight gain with heavy exercise or purging. Due to heavy binging and purging, the patient may have cardiovascular problems like low heart rate, electrolyte imbalance leading to irregular heartbeats and heart failure, gastrointestinal problems slower digestion known as gastroparesis which can further cause stomach pain, bloating, nausea, vomiting, blood sugar fluctuations, constipation, wearing out oesophagus which also causes pancreatitis. Various neurological problems like seizures, muscle cramps, sleeping problems and endocrine problem like osteoporosis, binge eating lead to resistant to insulin, causing type 2 diabetes as well. Another cause of an ED is by heredity or due to genetic relationships (Hudson et al., 1983). With the presence of an ED in the family, the risk for the patient becomes high (Mumford et al., 1983). Also due to substance abuse and another kind of abuse to the patient can lead to an ED. Prevalence of ED is less in India as compared to the western countries (Srinivasan and Jayaram, 1991).

Bulimia Nervosa

Bulimia Nervosa (BN) is a critical psychological eating disorder where a person has loss of control and ingests a substantial amount of food in a short period of time and purge out the food consumed to avoid weight gain (Rushing et al., 2003). He binges i.e., eats more than he is supposed to and purge through various forceful means to prevent weight gain (Wilson and Sysko, 2009; Telch et al., 1998). In bulimia, along with binging, there is a purging action so as to remove the food lucratively before getting the food digested. A person can purge out the consumed food by forced vomiting, excessive use of a laxative or elonged period of exercise (Rich, 1978). A person suffering from bulimia nervosa commonly known as bulimia experiences a loss of control which leads them to agitation to undue feelings (Accurso et al., 2014) and a self-perpetuating mechanism in maintaining the disorder (Russell, 1979). Contrary to popular belief, everyone suffering from bulimia does not necessary purge. Bulimia is of two types: Purging bulimia and non-purging bulimia. In Purging Bulimia regular vomiting occurs due to the use of laxatives and diuretics after binging episodes. While non-purging bulimia compensates for calories in other ways by severely restricting food intakes, regular fasting and excessive exercise (Hay et al., 2010).

BN is prevalent in adolescents with or without the loss of control. (Goldschmidt et al., 2015). Within a group of girls, overeating was noticed with girls having behavioural issues and weight control behaviours and depressive symptoms, while in boys, it was associated with substance abuse, depressive and anxiety symptoms.(Shomaker et al., 2010).

Biochemical Alterations

In BN various biological and psychological changes occur due to these biochemical alterations (Mira et al., 1984). The self-regulatory processes are impaired in bulimic women, the neural system has functional abnormalities like loss of control (Bruce et al., 2009) which contribute binge eating and impulsive behaviour(Peñas-Lledó et al, 2002). These biochemical factors are the abnormal activity of brain neurotransmitters and the hormones. Thus, there is a need for screening the abnormalities in the bulimic patients (Marsh et al., 2009; McKay et al., 1986).

The hypothalamus region is webbed with neurotransmitters like norepinephrine, serotonin and dopamine. Serotonin, made up of amino acid L-tryptophan, is highly responsible for eating habits (Weltzin et al., 1995). Studies show that in BN, the serotonin level decreases (Kaye et al., 2000). The hormone, Cholecystokinin (CCK) which causes satiation is low in women with bulimia. Leptin is another hormone that is produced by the fat cells of the body. The peptide hormone leptin is involved in the regulation of appetite. The decrease in leptin is seen in bulimic patients as well. (Metzger et al., 2000)

The gastrointestinal tract has peripheral signals that regulate appetite, ghrelin and peptide YY regulates hunger and satiety. Ghrelin evokes hunger whereas PYY evokes satiety (Kojima et al., 2005).

In a study, it was found that women with low cortisol response have a high amount of anxiety, poor body esteem etc. There is an inverse relation between impulsivity and cortisol level (Hollander et al., 2008)

The combined effect of low level of CCK and serotonin, PYY, cortisol causes lack of satiety which leads to bulimic binges in the patients. (Hayes et al., 2005). These hormones or their receptors can cause substantial pathology leading to obesity or anorexia (Austin et al., 2018) which occurs due to the disturbance in the serotonergic pathways (Walderhaug et al., 2002).

Problems In Body Due to Binging and Purging

ED are mental illnesses that manifest with disturbance to feeding behaviours and body weight regulation, which subsequently compromise across physiological systems including gastrointestinal and cardiovascular functions (Yan Y et al., 2017).

In BN, the individual has behavioural and physiological side effects. The behavioural issues can be anxiety, compulsive behaviour, binge eating, low self-esteem and depression. This disorder also affects the body physically (Mehler et al., 2015). (Vizzard and Abrahman, 1984) found in a study that the group of women with BN had a significantly lower concentration of potassium chloride and phosphate in plasma due to which hypokalaemia occurs which is highly associated with self-induced vomiting and laxative abuse.

The bulimic patients who purge have swelling and soreness in cheeks and the saliva present in the mouth turns acidic (Touyz et al., 1993). This causes cavities, tooth enamel erosion, gum disease, yellowing and deteriorating of teeth. Gums and teeth become sensitive to hot and cold foods. Throat and oesophagus become sore and inflamed (Kiss et al., 1989). Purging also causes tear and rupture of blood vessels which consequently leads to blood in vomit, higher inflammation levels, lower immune response, fatigued muscles, stomach ulcers (Forney et al., 2016). There are dermatological manifestations and cardiac ailments as well like abrasion of knuckles, dry skin, irregular heartbeat, heart failure, low pulse and blood pressure (Glorio et al., 2000; Strumia R, 2013). Dehydration also occurs due to low electrolytes like potassium, magnesium, sodium. (Rushing, 2003) Gastrointestinal problems are also noticed like constipation, irregular bowel movements, bloating, diarrhoea, abdominal cramping which are caused by taking laxatives and altering enzymes and electrolyte levels (Gwee and Kang, 1990).

In bulimia, there is a likelihood of having weight fluctuations that negatively impact in thyroid and hormonal health (Obarzanek et al., 1991). In women, disordered eating and nutrition can affect menstruation, fertility, maternal weight gain, and fetal well-being (Stewart et al., 1990). A high amount of stress coupled with nutrient deficiencies, can alter hormone levels and change the neurotransmitter functioning as discussed (Obarzanek et al., 1991).

Pharmacological and psychosocial interventions:

BN can be managed using pharmacological treatment and psychosocial treatment. Moreover, combined treatment approaches are much more effective at protecting individuals (Bacaltchuk et al., 2001).

Currently, BN is treated using Cognitive Behavior Theory (CBT) and Interpersonal Psychotherapy like Focal Supportive Psychotherapy. These are counselling sessions which are conducted to proliferate mental health and well being of an individual and also by self-help.

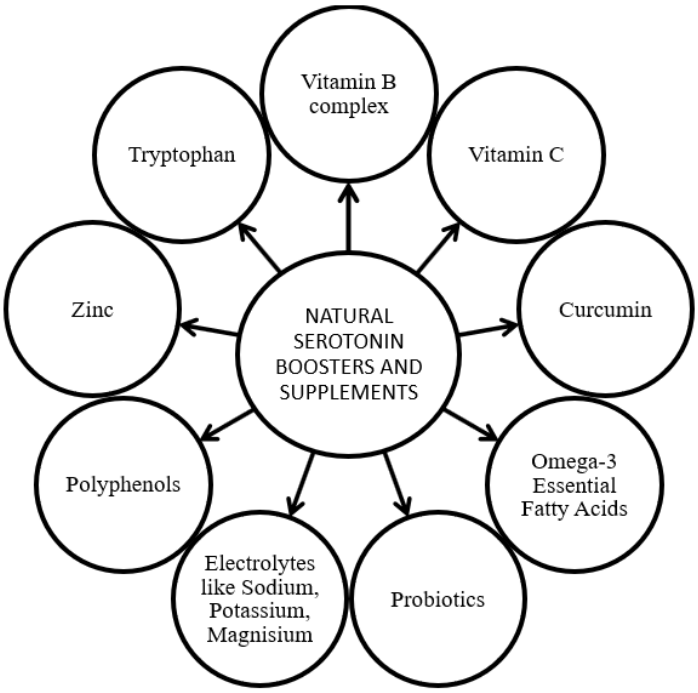
Simultaneously, most frequently used pharmacologic treatments, ie, intake of antidepressants like Fluoxetine (Wong et al., 1995), Bupropion (Horne et al., 1988), Imipramine (Pope et al., 1983) or Lithium Carbonate (Hsu et al., 1991) helps in the treatment of bulimia but has its own side effects like insomnia, nausea, asthenia, and tremor, seizures. Selective serotonin reuptake inhibitors (SSRIs) like fluoxetine has adverse effects and symptoms such as pain, nausea, depression, and anxiety and sexual malfunctions like erectile dysfunction (Ferguson, 2001). Therefore, there is a higher rate of dropout from the course of medication (Bacaltchuk and Hay, 2003).

This paper reviews an approach to managing Bulimia Nervosa by nutritional management and consumption of various micronutrients and supplements.

Deficiency In Bulimic Patients

According to research, bulimic patients are deficient of various nutrients like Vitamin B, mostly Thiamine, Riboflavin and pyridoxine (Pirke et al, 1989), folate, zinc (Eedy et al., 1986), omega-3,6 fatty acids, Vitamin D3. Vitamin B is found in beans, whole grains, seeds, meat and vegetables.

Brain chemicals mainly serotonin, which dictates our mood are derived from amino acids in protein foods. In Bulimia there is a depletion of tryptophans which lowers the serotonin level, thus leading to binging of food (Wolfe, Metzger, Jimerson). Rigid behaviour pattern emerges due to decreased serotonin. This causes obsessive and compulsive behaviour like obsession with calorie counting and with undereating (Bruce et al., 2009). Various non-drug serotonin supplements and boosters are present naturally to increase serotonin. 5-Hydroxytryptophan (5-HTP) is a herbal supplement found in Griffonia simplicifolia seeds. Vitamin B complex, Vitamin C and zinc are some other factors which increase serotonin level. Zinc and omega-3 essential fatty acids along with herbs like curcumin help boost serotonin level in our body.



Natural Ingredients and Nutrients To Manage Eating Disorder

Classic symptoms like loss of normal appetite, apathy, lethargy, retarded growth, interrupted sexual development are regulated by zinc, which is usually found in red meat, egg yolk and sunflower seeds. Also, to combat folate deficiency, spinach consumption is necessary as it is high in folic acid. It helps in easing depression and rebuild a healthy digestive system, affecting the body in two ways: the dietary and mental affliction of disorder (Ko et al., 2014).

For HUFA, salmon should be consumed as it is high in omega 3s. Omega 3 fatty acid is essential for rebalancing metabolism and organ systems. Omega 3s help mental balance, increase mood, reduce anxiety, warding off chronic stress leading to compulsive behaviour (Bozzatello et al., 2016).

Even probiotics should be used in the management of BN as it is considered as psychobiotic. They help in regulating the metabolic functions and acts as a barrier for psychotic disorders, and have positive inflammatory effects. It is an evolving tool for fighting mental illness (Deans, E, 2017). Probiotics especially increase and help to cultivate this helpful bacteria to begin increasing nutrient intake efficiency. Moreover, an altered gut microbial profile is likely to play a role in the co-morbidities of ED with altered immune function, short-chain fatty acid production, gut–brain and gut–diet interactions (Yan Y et al., 2017). Not just that, as due to purging, bile and gastric juice hurl up through the respiratory system and throat, degrading the stomach lining, probiotics can help in rejuvenating the eliminated substantial amount of beneficial bacteria that we need in our gut to maintain. Also, fennel seeds which add flavour and pleasant aroma to our meals is anti-inflammatory, carminative and antibacterial and have fat burning properties. It can provide better digestion and eliminate binge eating, cure nausea and mood swings (Badgujar et al., 2014). Even turmeric which has curcumin, a yellow pigment is a natural anti-inflammatory and anti-bacterial agent. It heals damaged oesophagus and upset stomach due to regular throw up. It is also used to treat mood swings and stomach cramps caused due to bulimia vomiting. It can improve bowel movement, bloating and can aids digestion. As it is a highly potent antimicrobial agent, it can be shown to be active against various chronic diseases including obesity, cardiovascular, pulmonary, neurological and autoimmune diseases (Kunnumakkara et al., 2017). The antioxidant components analysed were polyphenols, vitamin C, β carotene and tannins present in turmeric (Semwal et al., 2015).

Polyphenols have anti-inflammatory and antioxidant properties, there are various dietary benefits of it in maintaining brain health and mental and brain-related disorders. Over 8000 polyphenolic compounds of plant origin are present and identified as having brain protective properties. Herbal polyphenols found in food and supplements have fewer side effects as compared to pharmacological treatment. Polyphenols can be differentiated into three categories, flavanoids, non-flavanoids and phenolic acid. Several identified polyphenols affect synaptic and neuronal processes in the brain, stabilising the mood by increasing the serotonin and dopamine level.

Ginger also soothes metabolism and help burn fat faster and enhances thermic effects and makes people feel full and help them avoid overeating. Effective in stimulating gastrointestinal traits, it can help in reduction of gas formation and can aid digestion (Pilerood et al., 2011).

Citric fruits like grapefruit, orange, pomegranate and berries like blackberry, blueberry and drupes like plum and prunes are the best treatment for vomiting as they have dietary fibres, which improves digestion. As these fruits have vitamin C, they are anti-oxidative, anti-inflammatory, anti-cancer and have cardiovascular protective effects, neuroprotective effects, etc (Jabeen and Aslam, 2011; Lv, Xinmiao et al, 2018; Keservani et al, 2016). Also, watermelon fruit contains flavonoids (Oseni and Okoye, 2013) and watermelon seed oil has a positive impact on growth and it has cardioprotective which arrests the side effects of BN. (Biswas et al., 2017). Similarly, aloe vera has medical reputable properties (Kojo and Qian, 2010). As discussed, in BN there is binge eating and purging, which affects the gastrointestinal system, by depleting the crucial minerals and nutrients and makes the body bloated. For that, aloe vera can be used to sooth the upset stomachs and quickly reduce the bloating stomach, eliminating dangerous triggers from the equation of the recovery (Hamman JH, 2008). It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals (Surjushe et al., 2008). It also has anti-inflammatory action (Hamman JH, 2008) and minerals like potassium, zinc, copper which can help in managing BN.

Ginseng can be used too. It is the root of the plant that helps in managing an ED with a preexisting mental disorder. Ginseng help stimulates appetite, boosts mood, relieves anxiety, soothe trouble and compulsive behaviour, it is a herbal substance (Xiang et al., 2008). Bulimia Nervosa is prevalent mostly in women, therefore the food sector can introduce new and innovative products to help manage the symptoms of Bulimia Nervosa. The study of biochemical alternations from gastrointestinal tract and appetite centre hypothalamus gives an incentive for the dietary supplements to increase the Serotonin level in the brain along with an increase in Ghrelin and decrease in PYY and CKK to control bulimic binges. Thus, various supplements like zinc, vitamin B complex, herbs like ginseng, Gymnema, curcumin and natural boosters like omega-3 essential fatty acids, probiotics, electrolytes like potassium, magnesium manages Bulimia Nervosa. The novel studies of Polyphenols and nano foods is a varients which nutraceutical sector can utilise for more innovative and health supplements for eating disorders.

Food Managing Bulimia	**Active Ingredients**	**Regulations in Body**	**RDA**	**Form of Consumption**
probiotics	Bacteria and Yeast	acts as a barrier for psychotic disorders, and have positive inflammatory effects	No RDA value	Fermented Dairy Products, Beverages, Supplements
Turmeric	Curcumin	anti-inflammatory and anti-bacterial agent, heals damaged oesophagus and upset stomach due to regular throw up, treat mood swings and stomach cramps, improve bowel movement, bloating and can aids digestion, potent antimicrobial agent	1-3 grams	Spice
Ginger	Gingerol	anti-inflammatory and antioxidant effects, soothes metabolism and help burn fat faster, elicit satiety, reduce gas formation	2-4 grams	Spice and Condiment
Alovera	19 Amino Acids, 12 anthraquinones, 8 enzymes, Auxin, Gibberellin, lignins, Salicylic Acid, Saponins, Sterols, Vitamins and Minerals.	sooth the upset stomachs, reduce the bloating stomach, eliminating dangerous triggers , anti-inflammatory action	No set dose	Gel, Juice
Alfalfa	Vitamins, Minerals: Electrolytes, Saponins, Sterols, Enzymes, Polyphenols, Amino Acids	anti-inflammatory and antitoxic properties, high cholesterol, asthma, osteoarthritis, rheumatoid arthritis, diabetes, upset stomach, and a bleeding disorder	No Information found	Sprouts, Supplement
Valerian roots	Alkaloids, GABA, Isovaleric acid, Iridoids	curing anxiety along with insomnia and nervous restlessness and used for treating stomach, intestine cramps, and improves appetite	GRAS by USFDA	Dried Roots, Plant extract, dietary supplement

Gymnema	gymnemic acids and gymnemasaponins	Antimicrobial, anti-inflammatory, and anticancer properties, treatment of obesity, dental caries, antibiotic, in stomachache.	2-4 gram	Dietary Supplement and Extract
Ginseng	Ginsenosides	stimulates appetite, boosts mood, relieves anxiety, soothe trouble & compulsive behaviour	1-2 gram	Roots, dietary supplements

Table 2: Food Managing Bulimia, their active components, regulations in the body, RDA value and the form of consumption

Conclusion

Bulimia nervosa is prevalent mostly in women, therefore the food sector can introduce new and innovative products to help manage the symptoms of bulimia nervosa. The study of biochemical alternations from gastrointestinal tract and appetite center hypothalamus gives a incentive for the dietary supplements to increase the serotonin level in the brain along with increase in ghrelin and decrease in PYY and CKK to control bulimic binges. Thus, various supplements like zinc, vitamin b complex, herbs like ginseng, gymnema, curcumin and natural boosters like omega-3 essential fatty acids, probiotics, electrolytes like potassium, magnesium manages bulimia nervosa. The novel studies of polyphenols and nano foods is a varients which nutraceutical sector can utilise for more innovative and health supplements for eating disorders.

Abbreviations

BN, Bulimia Nervosa, CCK, Cholecystokinin, CBT, Cognitive Behavior Theory, SRI, Selective Serotonin Reuptake Inhibitors, NPY, Neuropeptide Y, HUFA, Highly Unsaturated Fatty Acids, EPA, Eicosapentaenoic Acid, DHA, Docosahexaenoic Acid, GABA, Gamma Amino Butyric Acid, PYY, Peptide YY

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