Eating disorders – even voluntary fasting has health consequences

Limited food intake was usually connected with hard times of wars, natural catastrophes, epidemics and climatic changes in European history. Nowadays, the public health in most European countries has been concerned with increasing rates of obesity and its general health consequences. Although obesity does not automatically mean that the food intake is balanced albeit excessively increased and there is fair evidence that overweight people can suffer from malnutrition, real cases of malnutrition and cachexia are rarely seen in Europe due to socioeconomic factors. Outside Europe and other developed countries the situation is very different.

Although it was known for centuries that some people are able to starve voluntarily and the first medical descriptions of severe malnutrition states due to voluntary starving are from the 19th century (Lasègue, 1873 – De L'Anorexie Hystèrique), it was not before the second half of the 20th century when these conditions began to be widely recognized by doctors and the public.

Starting in the 70's a new "epidemic" of voluntary starvation has appeared in developed countries. The affected are adolescents and young adults otherwise healthy. Ninety percent of them are girls and women. One up to five percent of female population in developed countries suffer from that condition that has been called "Eating disorders" in psychiatry.

Anorexia nervosa, bulimia nervosa and *binge eating disorder* are the most common forms.

Symptoms used for the diagnosis of anorexia and bulimia nervosa	
Anorexia nervosa	**Bulimia nervosa**
Abnormal eating	
• Restricting food intake and weight loss to less than that minimally expected for age, sex and developmental stage	• Recurrent episodes of binge eating that are associated with a sense of loss of control and the episode is an unusually large amount of food
Fear of gaining weight	
• Persistent behavior to avoid weight gain (e.g., dieting, exercising—restricting type—vomiting, purging, using laxatives—binge eating/purging type)	• Compensatory behavior in order to prevent weight gain after binging (e.g., vomiting after binging, -purging type- alternating periods of fasting, excessive exercise -nonpurging type-) • Weight is usually average or above average
Body shape distortion	
• Undue influence of one's body weight or shape on self-evaluation • Lack of recognition of the seriousness of the problem	

Both patients with *anorexia nervosa* (AN) and *bulimia nervosa* (BN) are obsessed with their body and wish they were thin and thinner than they are. They usually gradually restrict the food intake

(sometimes to minimum or zero). This leads to weight loss but rarely to a state of satisfaction with their body.

In AN patients rigorous starvation leads to profound depletion in muscle and fat mass. During the course of the disease, the resting energy expenditure decreases proportionally to the loss of lean body mass with a decrease in thyroid hormone secretion. The metabolic adaptation during anorexia nervosa is similar to that observed during starvation with a relative sparing of protein stores. After an initial weight loss, the total energy expenditure is similar to that in normal individuals, with a decrease in resting energy expenditure and an increased energy-related physical activity. At the end stage of wasting, however, physical activity dramatically decreases as well as energy intake. Glucose is low in anorexia. The thyroid is often protectively and reversibly underactive in anorexia nervosa, with normal or slightly low TSH, normal or slightly decreased T4 and regularly decreased T3. Electrolytes may show low (reflecting low protein intake) or high urea (reflecting dehydration) and low potassium (vomiting). Extreme starvation can cause liver damage. Anorexia often causes anemia. Neutropenia is usual in starved patients. Bradycardia is common. Bone density decreases and there is an increased risk of osteoporosis. The skin loses hydration, becomes dry and vulnerable to excoriations. Feeling of being cold is present together with acrocyanosis due to loss of subcutaneous fat. Lanugo (very fine hair) appears over the body. The menstrual cycle is suppressed. Immune responses may be decreased due to protein deficits with and increased risk for infections that can easily lead to a collapse of the organism. AN has highest ratios of death due to somatic complications among psychiatric disorders.

In BN patients although there is a strong wish to reduce body weight and a reducing of food intake is also used as a strategy, there is another specific symptom. Probably induced by the starving a *bulimic attack* occurs. This is also called a *binge* - a quantity of food consumed at a single sitting, which is considerably larger in amount than what would be reasonably consumed at the time AND there is a sense of loss of control over the consumption of the food. The quantity of food binged can be really huge. After the binge a feeling of remorse appears and the fear of being fat increases. To avoid it patients vomit/purge. Such purging may occur several times a day. The balance in this chain of starving – bingeing – purging determines the final body weight which may be normal, under or over and typically changes rapidly with up to several kilograms over a week. MB may be complicated with stomach dilatation, stomach and esophageal ruptures (due to bingeing), severe hypochloremia and hypokalemia leading to cardiac arrhythmias; increased caries, swelling of parotid glands and periodontitis (due to vomiting).

Binge eating disorder (BED) is recurrent regular binge eating in the absence of purging, vomiting, fasting or compulsive exercise as compensatory behavior. It leads to obesity.

Comparative symptoms in the eating and feeding disorders					
Disorder	**Weight**	**Body image concerns**	**Presence of bingeing**	**Purging**	**Comments**
Famine induced starvation	Low	No	When food available	No	Starvation brings its own psychological consequences
Weight loss of physical illness	Low	No	Not usually	No, though vomiting and diarrhea may occur as part of the illness	
Anorexia nervosa, restrictive type	Low, and usually stable	Yes, marked, although occasionally thinness and starvation are valued for religious reasons	No	No, by definition. However, compulsive exercise is often part of the picture	Deliberate self-harm may be used to self-punish or if obligatory refeeding is imposed
Anorexia nervosa, binge purge subtype	Low and fluctuating	Yes, as for AN restrictive type	Yes, but usually smaller binges than in normal weight BN	Yes, by self-induced vomiting, use of laxatives, compulsive exercising or over activity	See above
Bulimia nervosa	Normal (low, high)	Yes	Yes, often massive	Yes	

Differences between AN and BN

Besides the above described differences between the two disorders, there are some more. The age of onset is usually earlier in anorexia than in bulimia. Although both can appear anytime in life, the typical age of onset of AN is the beginning of puberty (10-13 years) while BN usually presents after 16 years (sometimes with previous AN episode).

The personalities also differ between patients with AN and BN. Girls with AN are usually less socialized, more perfectionistic, goal-aimed, performance oriented, hard working at school nice and helpful at home with parents, doing thing “the right way”. This may change a bit in the adulthood. Patients with BN are more extraverted, social, impulsive, they have more relationships, more romantic and sexual partners and more experiments with alcohol and psychotropic drugs.

Etiology of Eating disorders

Genetics and neurobiology

There is substantial evidence that complex genetic factors predispose to the development of the various eating disorders. Family studies have demonstrated the aggregation of cases within families, whilst twin studies of both anorexia and bulimia indicate greater concordance for monozygotic than dizygotic twins. Where there is anorexia in a family member, it is often found that other relatives frequently show high perfectionistic and obsessive personality traits. Rather than inheriting an eating disorder *per se*, individuals appear to inherit personality traits of perfectionism and high anxiety, and reduced central coherence (the cognitive tendency to perceive fine detail rather than the "bigger picture").

Where there is bulimia nervosa or binge eating disorder, other relatives seem more likely to be vulnerable to obesity, depression and substance misuse.

Looking to the future, research is increasingly investigating the relationships between disturbed gut hormones and appetite regulation in eating disorders. Potentially, the impact of starvation on gut microbiota may help explain changes in satiety and taste perception.

In the acute phase of AN there is significant gray and white matter decrease. Decrease in gray matter is more prominent in adolescents. After recovery the decrease normalizes.
Glucose is a very important substance for brain cells including neurons. In times of starvation ketones and lactate can be used as alternatives. The glucose utilization in the brain of patients with AN differs from healthy controls. It is difficult to assess whether the changes in brain functions are primarily due to the mental disease that leads to starvation or secondarily due to starvation itself.

Several authors consider that the deregulation of cytokines and defective natural cytotoxicity in anorexia nervosa are related to a semi-starvation state and not to a primary etiological role of cytokines. Other investigators believe that some cytokines, such as the TNFα, may contribute to weight loss and its perpetuation, and to the cachexia of anorexia nervosa. The fact that some cytokines are elevated rather than depleted in eating disorders, while there is relative protein energy malnutrition, may also be considered as secondary to a physiological compensatory mechanism leading to a transitorily enhanced production of cytokines. Immune dysfunction is tightly bound to impaired nutrition even in slightly low-weight bulimic patients and could thus be responsible for medical complications in chronic
underweight eating disorders.

Psychological, social and cultural factors

Age, gender and ethnicity are known risk factors. Other factors include personality features, emotional problems, negative life events, sexual abuse in childhood, social isolation, some occupations and leisure time activities (ballet, gymnastics, figure skating, modeling), long-term family problems and inadequate social pressure for achievement and success. Cultural factors are important triggers for dieting. The ideal body proportions in popular culture changed during the 20th century and being slim, thin and even skinny became the aim of many adolescents. The Barbie doll is often blamed for the body image distortion in girls. Although the cultural factors influence most girls in the population only a small proportion of them develop a clinical eating disorder. It would be important to know the specific characteristics of those girls to prevent such an unfavorable development.

Life course and prognosis

Anorexia nervosa is one of the most lethal psychiatric conditions and whilst around 40% may achieve a full recovery, a small percentage have a severe and enduring course; the average time to recovery (where it occurs) is six to seven years. Younger, intensively-treated patients often show a more rapid improvement, and it is likely that some cases will have resolved even without treatment.
Whilst symptoms of bulimia nervosa may remit spontaneously in the young, there is still disagreement as to whether early diagnosis and intervention bring about better outcomes or whether they merely reflect the natural course of the disorder in teenagers. Over fifty percent of individuals with bulimia nervosa or binge eating disorder will achieve remission at five years of follow-up but untreated symptoms are likely to persist with significant impact on health related quality of life.

Treatment

The treatment is multidisciplinary, complex and complicated. It includes refeeding as the first and important step which is the most complicated in the same time as patients do not wish to increase their weight and they resist. Though most psychotherapeutic treatments have limited effect in cachectic and markedly underweight patients some behavioral and motivational approaches can be used in this phase. When the weight improves more psychosocial approaches are used, including individual, group and family psychotherapy, nutritional consultations, physiotherapy and community and self-help groups and resources. Different complex therapeutic programs exist with similar effect which is still moderate. Pharmacology is seen as second line treatment that is ineffective for the core eating disorder symptoms but may help with comorbid mental conditions. In bulimia SSRI antidepressants are effective in reducing the binge-purge cycle frequency.
Drop-outs from the treatment are common and the rates of suicidality are above population average.

Refeeding syndrome

The refeeding syndrome is a potentially fatal shift in fluids and electrolytes that can occur in malnourished patients receiving too fast, imperfectly balanced, artificial or even oral feeding. It may encompass a mixture of biochemical, electrolyte, fluid balance and metabolic changes that may include—or lead to—hypophosphatemia, hypomagnesaemia, hypokalemia, gastric dilation, congestive cardiac failure, severe edema, confusion, coma, and death. The refeeding syndrome was a common cause of death in the early management of anorexia as well as other starved patients. However, there has been criticism that current guidelines on refeeding are over-cautious and lead to initial further weight loss with increased risk and longer stays in hospital. With adequate medical monitoring and replacement, especially of phosphate, refeeding syndrome should not occur.

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