

Anorexia nervosa: Disease process, challenges and hope

Jiayi Sun

School of Medical Laboratory, Tianjin Medical University, Tianjin, 300000, China

jiayi.sun@tmu.edu.cn

Abstract. Anorexia nervosa, as a psychiatric disorder with a progressively high prevalence, is characterized by the following features: high mortality rate, serious harm, long-lasting effects, difficult to cure and easy to relapse. In recent years, Awareness of anorexia nervosa is different than in the past, going deeper: it is a complex disorder involving multiple systems. Many disciplines are also actively exploring it. However, there are still problems such as Pathologic mechanism unclear, no clear indicators of disease, no targeted drugs, and insufficient public awareness. This article analyses research in the fields of social environment, immunology and brain science in the order of disease onset, evolution and treatment (including difficulties in the treatment process, such as in Refeeding syndrome), and puts forward some recommendations for earlier intervention, comprehensive treatment, and optimization and maintenance of therapeutic efficacy in anorexia nervosa. It is also hoped that public awareness and attention will be raised. There are still many gaps in the road to overcoming anorexia nervosa, which has a large research space and is also not less challenging. Future research could focus on finding objective indicators for diagnosing anorexia nervosa or suggesting recovery, and finding targeted drugs from the perspective of multi-system interactions.

Keywords: Anorexia nervosa, refeeding syndrome, occurrence, treatment.

1. Introduction

In recent years, anorexia nervosa has attracted more attention from scholars due to its rising prevalence and serious harm. Anorexia nervosa (AN) is an eating disorder characterized by an individual's intentional attempt to cause and maintain a body weight that is significantly lower than the normal norm, including through dieting. Prominent features of AN include refusal to recognize severe underweight and dietary restriction [1]. AN has the highest mortality rate among psychiatric disorders, with a 5% to 6% mortality rate. The treatment outcomes for AN are not promising [2]. Emergency records (longer than fifty years) show that less than 50% of patients have complete remission, around 30% still have residual symptoms, while 20% develop chronic disease [3]. Patient distribution exhibits the following characteristics: more females than males, the peak age of onset is adolescents, and there is a trend towards younger age of onset.

The main harms of AN include subjective suffering, objective damage, disease characteristics, and interactions. In terms of subjective suffering, intense fear of weight gain, anxiety caused by excessive focus on food calories, and physical and psychological discomfort caused by self-limiting behaviors (e.g. dieting, purging behaviors or excessive exercise). These bring about physically and psychologically distressing experiences for the patient. In terms of objective damage, pathological behaviors cause a decline in physical functioning. Low body weight leads to malnutrition, low protein, anaemia, fatigue,

oedema, amenorrhoea and other neuroendocrine-immune multi-system changes that can even be life-threatening. In terms of disease characteristics, the effects of AN are long-lasting, difficult to treat and are prone to relapse. In terms of interactions, AN show a high tendency to occur in combination with other psychiatric disorders [2].

AN causes significant physical and mental distress to patients, negatively impacts their occupational and social functioning, and places a burden on their families. Especially for adolescents, experiencing AN during the critical period of growth and development may experience long-lasting adverse effects on their physiology and psychology.

It is encouraging to note the progress made in recent years in the study of AN. Previously regarded as a psychiatric disorder, AN is now understood to be a complex disorder that also involves multiple systems, such as metabolism and immunity [4]. Further research is being conducted in the fields of brain science, genetics and epigenetics, neurobiology, and microbiology [5], which have contributed significantly to the diagnosis and treatment of AN. AN has also been categorized in greater detail. In terms of age of onset (represented by children, adolescents, adults, etc.). From the perspective of disease behavior pattern, AN can be divided into two categories: strict control and binge/purging. And there is a more detailed differentiation of diseases related to AN. Studies have been done to differentiate and compare AN and atypical anorexia nervosa in terms of behavioral patterns and prognoses [6]. These distinctions also better serve clinical diagnosis and treatment.

However, there are still formidable challenges in dealing with AN: the public is still under-aware, under-appreciated and poorly informed. Adolescents, in particular, are often not understood by their parents or friends, and do not receive effective help from their environment. AN itself is insidious, manifested by patients concealing the fact that they are suffering from the disease and resisting treatment. Increasing public awareness may be conducive to the prevention, detection and treatment of AN. This article reviews the four aspects of AN: onset, progression, treatment and recovery, and makes suggestions for preventing AN and improving the effectiveness of treatment. The article focuses on adolescent patients. Aiming to increase public awareness, prevent AN, detect it early and encourage treatment, as well as improve and maintain recovery outcomes.

2. Occurrence of AN

AN is a psychiatric disorder that involves multiple organs and systems in the body. The process of AN is long and complex. Some The patient describes, 'At first it takes effort to control the behavior, such as dieting with a purpose, and then for some reason the behavior seems to stop, as if there is no purpose to it.' This appears to be very cunning in the onset and progression of the disease - it is as if the AN is controlling the patient by some magical means. This section looks at the causes of AN.

2.1. Environmental factors

Aesthetic culture influences people's concepts, especially teenagers, whose psychological development is still immature and whose ability to discern information is not perfect. In China, the concept of thinness as beauty was once very popular. The blind pursuit of a slim figure prompted people to take measures to lose weight. Although not all dieters suffer from AN, it cannot be denied that the vast majority of patients claim to have spontaneously lost weight in the early stages of the disease, and a significant number of them do so in order to 'look good and pretty'. Judith Leins D Psych, Manuel Waldorf PhD et al. Decreased body satisfaction is associated with imagining pictures of thin bodies displayed in magazines [7]. Automatic processes and a shift from goal-directed to habitual behaviors may be important in the development and maintenance of eating disorders [7].

2.2. Immune factors

Increased secretion and concentration of inflammatory cytokines as well as genetic studies strongly suggest that AN has a 'dysregulated' immune system [8]. This dysregulation often manifests itself in an upregulated state compared to normal. This dysregulation often manifests itself in a more upregulated state than normal. That is, the basal level of inflammatory factors is higher or the immune response to a

stimulus is stronger. Stress can be a potential factor in the immune upregulation of AN [8]. The hypothalamic-pituitary-adrenal (HPA) system and the sympathetic nervous system (SNS) are capable of being activated by physiological stressors and stressful situations to produce appropriate hormones. Hormones further influence the immune system [8].

3. Progression of AN

The immune system acts as a bridge in the development of AN: abnormalities of the immune system can act as a cause of the disease and/or as a response to the environment and stress: as AN progresses, progressively more and more pronounced somatic symptoms are created. These symptoms, as well as mental distress, can also create more stressful situations. An 'intensified vicious circle' of cause and disease is thus reached. There are many such bridges, and immunity is only one of them; another important one is the brain. The negative response of the brain is more straightforward and more mental (the description of the brain in this section focuses on the changes in the brain after the onset of AN and the consequences of these changes, and does not focus on the congenital features of the brain that may be present in people with AN).

3.1. Somatic changes affect the brain

AN affects the brain of the sufferer by a principle that is not yet fully elucidated, which in turn affects people's behavior. This effect manifests itself in the form of abnormalities in the reward mechanism and altered perception. Interfering with the normal functioning of reward mechanisms: making the patient no longer rewarded for ingestion in a hungry state. Initially, pathological behaviors (e.g., persistent starvation, over-exercise, etc.) may provide a sense of reward, but they eventually become pathological or even punishments in the stage of reinforcement [9]. Alteration of the patient's perception of objective facts: this is expressed in the patient's false perception of hunger and satiety, and in the patient's false perception of his or her body size (self-perception of obesity). It has been demonstrated that some morphological and functional changes occurring in the brain are caused by AN [10]. Brain magnetic resonance imaging has shown that patients have increased volume of the cerebrospinal cavity but decreased volume of grey and white matter, which may lead to cognitive decline [10]. Fortunately, these changes are reversible, i.e., the grey matter and cortex can be restored with successful treatment and weight gain [11]. This has been described as 'pseudo-atrophic brain changes' [11].

3.2. Pathological behavior affects metabolism

Changes in metabolic patterns and hormonal disorders lead to the destruction of normal physiological functions and the disruption of the body's equilibrium. It is as if the patient has somehow adapted to the calorie shortage mode of life, and the patient's body enters a kind of 'power-saving mode'. The patient enters a state of metabolic decline, typically manifested by low body temperature and bradycardia [12]. This is not a good thing; this adaptation reinforces or even worsens the disease pattern. It creates resistance to treatment and recovery. In addition to metabolic decline, metabolic abnormalities are also reflected in abnormal secretion of multiple hormones, imbalances of multiple nutrients, including the three major nutrients (protein, fat, and carbohydrates) and micronutrients, and metabolic disturbances of water and electrolytes.

3.3. Other damage

The common restrictive behaviors of anorexia nervosa cause direct damage to the organism. Excessive and inappropriate exercise may cause wear and tear on the joints. Gastric acid during emesis burns the oesophagus and erodes teeth causing related diseases. Heavy chewing without swallowing food can also lead to enlarged salivary glands and tooth wear [13]. These are even irreversible injuries.

4. Treatment and rehabilitation

AN causes long-term and serious harm to the sufferer. The dual impact of AN on a person's physical and psychological well-being dictates that treatment and rehabilitation also need to take into account

both physical functioning and psychological well-being. However, given the hidden nature of the disease (AN patients often try to hide the fact that they are suffering from the disease or resist treatment), there are many patients who present with obvious physical symptoms. There are many cases in which treatment is forced after the onset of obvious physical symptoms. This is particularly common in adolescents. However, whether the physical symptoms are so severe that they interfere with life or the treatment is forced by others, the outcome of the treatment is not favorable and the treatment process is a distressing experience for the patient. This section focuses on analyzing and discussing current treatment methods, as well as the problems and challenges that may be faced during treatment.

4.1. Treatment modalities

Currently described according to international guidelines, psycho-behavioral therapy is a primary treatment that can usually be provided on an outpatient basis [14]. Admission to the hospital for systemic treatment is also offered to patients who have very severe somatic symptoms, who have little effect of outpatient treatment, or who are resistant to treatment. Inpatient treatment is more comprehensive in providing timely nutritional support for life-threatening malnutrition and supervision for patients who are highly resistant. The role of the family cannot be ignored in the treatment of adolescents. Family based treatment is considered as first line behavioral treatment [15]. Unfortunately, if the family members have insufficient knowledge about AN, they cannot provide scientific and effective help. At the level of pharmacological treatment, no effective drugs have been found for AN, and clinical pharmacological treatment is mostly symptomatic with the application of drugs for other psychiatric diseases [4]. In general, the current status of AN treatment is not ideal, and the probability of persistence or relapse after treatment is high.

4.2. Challenges in the recovery process

Patients with AN continue to face many challenges throughout their treatment and recovery. The recovery process is long and patients need to come to terms with weight gain and need to overcome their fear of gaining weight. Some patients report that there will be phases of intense food cravings, when they may even binge eat. Or there will be persistent bad behaviors of mono-eating and eating in limited quantities. This section describes three challenges: the refeeding syndrome, the pain and resistance during treatment, the continuing effects of treatment, and relapse.

4.2.1. Refeeding syndrome. Refeeding syndrome (RS) is one of the serious complications of anorexia nervosa, which often occurs during the course of treatment (may also be triggered by uncontrollable bulimic behavior of patients in non-therapeutic situations.) RS is an acute hormonal disorder caused by the reintroduction of excessive or inappropriate nutrients when prolonged anorexic behaviors have already resulted in malnutrition [16]. Patients often present with depressed oedema (more severe in the lower limbs and ends of the limbs, and in some cases even painful leg swelling and enlarged feet that make it difficult to wear shoes). This is usually brought on by a water-electrolyte imbalance, including a decrease in sodium, potassium, magnesium and phosphorus in the blood. Hypophosphatemia is also the most important diagnostic marker of RS [16]. RS suggests that long drought is not appropriate and should be regulated systematically and scientifically in the feeding process. In recent years, avoiding RS in the therapeutic process has gained clinical attention. However, at the same time, for patients presenting with more severe malnutrition, doctors and family members should also be highly alert to RS brought about by the patient's own overeating behavior.

4.2.2. Resistance to treatment and experience of treatment pain (mostly psychological). In the treatment of patients with AN (especially those who are extremely underweight and are forced into treatment due to somatic symptoms), weight gain is one of the aims of treatment and one of the necessary parts of the recovery process. Long-term low calorie intake, low fat intake, chronic malnutrition and low body weight, metabolic weakness and decreased basal metabolism can all change the normal physiological pattern [17]. People with AN are more likely to gain weight and crave more food after resuming food.

Patients need to overcome their fears and accept themselves. Extreme behavior such as throwing away food and medication is seen in many patients during this period and requires the attention of the doctor and his/her family. Patients may also run down because they cannot accept the weight gain, which deserves more care and professional psychological and spiritual support.

4.2.3. Risk of recurrence after treatment. Both those who have completed inpatient systemic treatment and those who have completed some stage of outpatient treatment show pathological behavior and psychology that persists for a certain period of time after the end of treatment or after the decrease in external attention. Patients with AN may exhibit prolonged extra attention to weight and calories, such as repeatedly measuring their body dimensions (arm, waist, leg, etc.), counting calories in food, and other restrictive behaviors, which can bring about anxiety and make it difficult for the patient to concentrate. Individuals who have suffered from AN are more susceptible to external influences, such as the mention of weight loss by those around them, comments about body weight and shape, or even simply negative emotions and events that have the potential to influence eating.

5. Suggestions

5.1. Early prevention and intervention

The outside world should pay more attention and provide positive guidance to patients with anorexia nervosa, and the public should raise awareness of AN and eliminate stigma and shame to encourage medical treatment. Avoid pathologization of maladaptive behaviors or psychological tendencies. Pathological behavior and psychological malignancy. Conduct regular psychological screening of the public and add eating disorder related assessments to evaluation lists to increase attention

5.2. Omni-directional attention

Cutting-edge fields to explore scientific test indicators, testing physiological indicators to suggest disease change, development or regression nodes, better assisting clinical diagnosis and adjusting treatment programmers. Functional and psychological rehabilitation should go hand in hand, as the disease has both physiological and psychological factors that are intertwined and affect each other, so as to maintain the safety of life and health status while avoiding false recovery (i.e., physiological functions are up to the standard, but the disease is still affected by the disease, such as calorie anxiety counting, self-limiting behaviors, retaliatory mono-feeding and so on), and to strengthen the education and re-cultivation of the true concepts and habits in the course of the nutritional treatment.

5.3. Rehabilitation and post-rehabilitation maintenance and follow-up

Prolong the attention to patients with anorexia nervosa and expand the scope of attention to patients with anorexia nervosa. When determining the effect of rehabilitation, strengthen the assessment of the patient's behavior and cognition based on the recovery of physiological functions. After finishing the intervention or treatment, the patients were visited regularly, including evaluating whether the eating behavior pattern was scientific, and whether the types and proportions of food intake were reasonable. Evaluate their level of anxiety, ability to concentrate and self-awareness. If risk factors and behaviors are identified, face them openly (the objective fact that anorexia nervosa is stubborn and persistent) and actively re-intervene.

6. Conclusion

Anorexia nervosa is a psychiatric disorder with a gradually increasing prevalence, characterized by high mortality rates and persistent recurrence. Anorexia nervosa affects many systems of the body and reaches a vicious circle with the body's reactions. The prevention and treatment of anorexia nervosa can be facilitated by looking for indicators or behaviors that may indicate the onset of the disease at an earlier stage, and by identifying breakthroughs in the vicious circle and overcoming them. In recent years, research has been actively pursued in a number of areas as understanding has deepened. However, there

are still problems such as the lack of a clear marker for the disease, the lack of targeted therapeutic drugs, and the lack of reliable rehabilitation assessment criteria, which deserve in-depth research. Anorexia nervosa should also be a cause for public concern and vigilance, even among non-medical workers and those not working in the life sciences.

References

- [1] American Psychiatric Association 2013 Diagnostic and statistical manual of mental disorders: DSM-5 5th ed Arlington VA: American Psychiatric Publishing Inc
- [2] Olivo G Gaudio S & Schiöth H B 2019 Brain and cognitive development in adolescents with anorexia nervosa: A systematic review of fMRI studies *Nutrients* 11 8 1907
- [3] Feng B Harms J Chen E Gao P Xu P & He Y 2023 Current discoveries and future implications of eating disorders *Int J Environ Res Public Health* 20 14 6325
- [4] Himmerich H & Treasure J 2018 Psychopharmacological advances in eating disorders *Expert Rev Clin Pharmacol* 11 1 95–108
- [5] Cerniglia L 2024 Neurobiological genetic and epigenetic foundations of eating disorders in youth *Children* 11 3 274
- [6] Walsh B T Hagan K E & Lockwood C 2023 A systematic review comparing atypical anorexia nervosa and anorexia nervosa *Int J Eat Disord* 56 4 798–820
- [7] Leins J Waldorf M Suchan B Diers M Herpertz S & Paslakis G et al 2021 Exposure to the thin beauty ideal: Are there subliminal priming effects? *Int J Eat Disord* 54 4 506–15
- [8] Gibson D & Mehler P S 2019 Anorexia nervosa and the immune system: A narrative review *J Clin Med* 8 11 1915
- [9] Zhong S Su T Gong J Huang L & Wang Y 2023 Brain functional alterations in patients with anorexia nervosa: A meta-analysis of task-based functional MRI studies *Psychiatry Res* 327 115358
- [10] Omi T 2023 Cognitive behavioral therapy for severe anorexia nervosa with brain atrophy *J Acad Consult Liaison Psychiatry* 64 3 309–12
- [11] King J A Frank G K W Thompson P M & Ehrlich S 2018 Structural neuroimaging of anorexia nervosa: Future directions in the quest for mechanisms underlying dynamic alterations *Biol Psychiatry* 83 3 224–34
- [12] Duriez P Mastellari T Viltart O & Gorwood P 2022 Clinical meaning of body temperatures in anorexia nervosa and bulimia nervosa *Eur Eat Disord Rev* 30 2 124–34
- [13] Silverstein L S Haggerty C Sams L Phillips C & Roberts M W 2019 Impact of an oral health education intervention among a group of patients with eating disorders anorexia nervosa and bulimia nervosa *J Eat Disord* 7 29
- [14] Hay P 2020 Current approach to eating disorders: A clinical update *Intern Med J* 50 1 24–9
- [15] Gorrell S Loeb K L & Le Grange D 2019 Family-based treatment of eating disorders: A narrative review *Psychiatr Clin North Am* 42 2 193–204
- [16] Skowrońska A Sójta K & Strzelecki D 2019 Refeeding syndrome as treatment complication of anorexia nervosa *Psychiatr Pol* 53 5 1113–23
- [17] Dulloo A G 2021 Physiology of weight regain: Lessons from the classic Minnesota starvation experiment on human body composition regulation *Obes Rev* 22 Suppl 2 e13189