

Adolescent Anorexia Nervosa Last Ten Years Review

Yiran Liu^{1, a, †}, Jia Wang^{2, b, †}

¹ Yiran Liu. Indiana University Bloomington

² Jia Wang. Nanjing Normal University

*Corresponding author. Email: liue@iu.edu; 18190202@njnu.edu.cn

†These authors contributed equally.

ABSTRACT

Although anorexia has become a popular disorder, there is a lack of recent reviews to update the latest research findings on anorexia, so this article aims to form a comprehensive review of anorexia nervosa (AN). *Through a literature search from two databases, only studies and research that focused on causes, impacts, and treatments of adolescent AN from 2010 to 2021 were reviewed. This article summarizes the etiology, impact and treatment of adolescent AN during the past ten years (from 2010 to 2021).* Family cultures, cultures, genes and other environmental factors could affect adolescents to have AN. Besides, AN has impacts on body dysfunctioning and social functioning. Treatments corresponding to causes, such as family-based treatment (FBT), parent focused treatment (PFT), and cognitive remediation therapy (CRT) are all popular treatments during these years. These findings of reviewed studies and research are updated information from the past ten years, our paper synthesized those findings which provides a reference for further studies on AN, and also could be a review of AN for other scholars.

Keywords: *Adolescents, Anorexia nervosa, Causes, Impacts, Treatments*

1. INTRODUCTION

The morbidity and mortality of eating disorders (EDs) ranks first among all mental diseases [1], which poses a challenge to clinicians. Patients with EDs are always trying to gain a sense of control and pride from controlling their eating behaviors in order to combat the feeling of lacking control of their thoughts, eating, and weight [2].

Anorexia nervosa (AN), a kind of eating disorder, is a serious mental disorder with three essential features: persistent energy intake restriction; intense fear of gaining weight or becoming fat, or persistent behavior that interferes with weight gain; and a disturbance in self-perceived weight or shape [3]. It has been found that adolescent girls and young adult women are particularly at risk since that AN typically begins in early-to-mid-adolescence [1]. The cause of AN is elusive, and its social, psychological and biological processes all seem to play a major part [3].

AN is becoming one of the common mental disorders with a large number of patients, and adolescence is the period before everyone becomes an adult. It is necessary for all scholars, parents, and the society to pay attention to adolescents' AN, to build a healthy environment. With

the development of mass media and science and technology, the causes, impact as well as the treatment methods of AN are all updating. However, there are few elaborate reviews of AN in adolescents in the past ten years. We therefore sorted out and screened the research in the field of adolescent AN in recent ten years and aimed to form an up-dated review of all of the causes, impacts and treatment methods of adolescent AN.

This review provides a comprehensive review of the research on adolescent anorexia after 2010. We searched literature from different databases and tried our best to be well-rounded and detailed in order to provide a comprehensive literature review with high reference value, so that researchers can learn recent research results more conveniently and comprehensively.

In summary, this article is an updated review covering the research results of etiology, impacts and treatments of adolescent anorexia in the past ten years as well as some recommendations for future direction.

2. METHODS

In developing this literature review, the two main databases searched to obtain information about the etiology, impacts and treatment of AN in adolescents are

Web of science and PubMed, while the databases on Web of science were limited to SCI and SSCI. Search items were used that combined: (1) anorexia nervosa and (2) adolescence. Titles were set as search fields for articles from 2010 till 2021.2. No language restriction was applied. The two databases were searched concurrently by using the following search phrase: (“Anorexia nervosa”) AND (“adolescence” OR “adolescent”) and this resulted in 23 records on Web of science and 283 on PubMed. After duplicates had been removed, there are 296 articles left.

From the remaining records, the following eligibility criteria were used to screen and select suitable references based on the purposes of this review:

- (1) Only articles which are available, peer-viewed, full-text, and published in English can be used,
- (2) Original empirical results must be reported in the article,
- (3) Only if the article investigate human participants can it be used,
- (4) The article must address at least one of the causes, impacts, or treatments of anorexia,
- (5) The article uses a reliable tool to measure and diagnose AN symptoms,
- (6) The focus of the study should be on adolescents, and emphasis should be placed on how adolescents differ from other populations in terms of the disorder.

Finally, 12 articles were included in this review.

3. RESULTS

A majority of studies found that there is a strong relation between biopsychosocial factors, including cultural and AN [4]. The researchers recruiting 8843 girls and 7696 boys as participants have found that there are three factors affect girls’ concerns of weight, parents, same sex media figures, and thin peers while boys’ concerns of weight are only directly related to watching TV. Additionally, Montcel *et al.* (2021) used 14 to 20-year-old female adolescents as subjects to investigate the influence of culture on AN and got the conclusion that Adolescents in culturally mixed environments may show refusal to food which is different from their traditional food [5]. From the genetic perspective, Yao *et al.* (2021) found that AN has significant genetic correlation [6]. A summary of the etiology of AN after reviewing literature is given in Table1.

Table 1. Summary Review of Etiology

Author/s and years	Participants	Etiology
Haines <i>et al.</i> (2010)	N=8843 girls and 7696 boys AN	Family & Culture
Montcel <i>et al.</i> (2021)	N=female adolescents AN	Culture
Yao <i>et al.</i> (2021)	N=782,938 AN	Genetic

AN has multiple impacts on both personal health and social functioning of patients. We found several articles (3/6) that looked at the negative effects of anorexia on bone health in adolescents. The article published by Eklund *et al.* (2010) has shown that teenagers with AN were found that hematopoietic cells in the bone marrow of peripheral bone transform into adipocytes prematurely which means AN patients are with potential implications for fracture risk [7]. The other two articles [8, 9] also reported AN’s impacts on bone health, especially bone strength. Teenagers’ brains may also be affected by AN for that Mainz *et al.*’s study in 2021 showed that the volume of brain change is related to weight change and it mostly affects the cerebellum. After weight recovering, transgenic changes in the brain will continue [10]. There are also articles (2/6) that focused on the impacts of anorexia on social functioning in adolescents. When it comes to complications, affective disorders and anxiety disorders, such as social phobia and obsessive-compulsive disorder(OCD) are found to be the most common comorbid disorders [11]. Also, Monctel *et al.*’s study in 2021 mentioned that anorectic symptoms may create a feeling of exclusion from the familial cultural environment which may cause family impairment [5]. The results of the impacts of AN are given in Table 2.

Table 2. Summary Review of Impacts

Author/s and years	Participants	Impacts
Eklund <i>et al.</i> (2010)	N=40 (20 AN patients and 20 healthy controls)	Personal health
Mumford <i>et al.</i> (2018)	N=41 AN patients mean age 21.2 ± 2.9 years	Personal health

Montcel <i>et al.</i> (2021)	N= adolescents AN	Social functioning
Singhal <i>et al.</i> (2018)	N=47 adolescents/young adults (AN)+ 55 controls	Personal health
Bühren, <i>et al.</i> (2014)	N=148 adolescents	Social functioning
Mainz <i>et al.</i> (2012)	N=19 Adolescents	Personal health

In terms of the treatment of AN, a majority of articles (2/3) have emphasized on the efficacy of some classic and well-known treatments such as family-based treatment (FBT) and parent-focused treatment (PFT). It is worth mentioning that Grange *et al.* got the conclusion that FBT has better feedback in short-term (12 months) trials while PFT has better results in long-term trials [12]. There are also several new treatments that have been validated by research such as refeeding protocol, which can effectively result in immediate weight gain and is well tolerated with no indicators of refeeding syndrome [13]. Cognitive remediation therapy (CRT) is another new way of treatment. In 2021, Timko *et al.* has proved this therapy is impactful because it is used to target the parents of the adolescents with anorexia, who would carry the burden of treatment of their children during FBT, so they can better understand their children [14]. Table 3 summarizes the research results in treatments and therapies of AN.

Table 3. Summary Review of Treatments

Author/s and years	Participants	Treatments and therapies
Grange <i>et al.</i> (2016)	N=107 teenagers AN	FBT; PFT
Madden, <i>et al.</i> (2015)	N=78 adolescents AN	Refeeding protocol
Timko <i>et al.</i> (2021)	54 family groups of adolescents and their parents AN	CRT to target the parent during FBT

4. DISCUSSION

The current review explored general information about AN. We found that most of the reviews on AN referred to literature that was published 10 years ago so that there needs an update. Also, there have been fewer reviews focusing on AN in adolescents. In this paper, we mainly review papers and studies between 2010 to 2021, trying to summarize the findings of causes, effects, and treatments of AN. We have obtained causes of AN in aspects of families, parents’ relationship, environmental effects; physical dysfunctions and mental issues triggered by AN.

As for the etiology of anorexia, there have been many studies with authoritative results so far. The biopsychosocial model will be used here to elaborate on the major achievements in the etiology of AN, many of which were obtained before 2010. From the cultural perspective, it has been found that the obsession with slimness, the core feature of AN, is concentrated in cultures where food is abundant while in the cultures of scarcity, people’s ideal body shape is more likely to be rotund [15]. Additionally, the media are often blamed for creating and presenting images of idealized physiques which greatly motivate people to achieve slimness. As a result of societal disparagement of overweight and glorification of underweight, many people begin to express dissatisfaction with their bodies. It should be added that women are the main audience for TV programs related to weight loss [16].

Studies of family interaction show eating-disordered family to be enmeshed and negating of the patients’ emotional needs [17] or overly concerned with parenting [18], which to some extent can explain the finding that insecure attachment is common in eating-disordered populations [19]. If the emotional needs of patients are ignored, treatment for them will be delayed and the condition will continue to deteriorate.

Apart from the environmental factors, there must be some unique physiological and psychological factors that lead to the particular patient getting sick with the AN. Professionals found that cognitive aberrations, including obsessive thoughts, rigid thinking patterns and perfectionism, can be the core features of AN which suggests that cognitive pathology may contribute to EDs [20]. We know that perfectionism and obsessive thoughts can make normal shortcomings more traumatic so that it is particularly torturous for perfectionists to endure their imperfection in body shape. From the biological perspective, the reading of the literature by Klump *et al.* (2000) leads them to conclude that 50–83% of the variance in AN and BN is genetic, which based on twin studies [21]. However, there is no clear answer as to how genetic factors cause the AN, and whether they act alone or in interaction with other factors such as environmental influences [22].

The Current review has also summarized new research findings about the etiology of AN. The way that parents communicate with adolescents about weights and body shapes could affect the images of adolescents about their appearances. Moreover, same sex images on social media could also affect adolescents' thoughts of their bodies. Girls are easier to be affected than boys. In a multicultural family, adolescents reported that they have difficulties to blend with other families' cultures, cultural conflicts also increase the risk of getting AN. There is a research [6] studied among full-sisters and maternal half-sisters about their genetic factors related to AN, and the result shows that full-sisters have higher possibilities to have AN than maternal half-sisters. Based on those studies, environment and genetic environment both have impacts on the adolescents suffering from AN.

Impacts brought by AN to adolescents are in aspects of body dysfunction and social functioning. Adolescents with AN could have physical and mental complications. Adolescent AN patients' bones [7] and brains [10] are different from adolescents without AN. Some impacts are long-term even lifelong for people, such as negative effects on bones [8].

Researches on the impact of AN before 2010 have also obtained multiple results. First, an irregular diet will lead to gastrointestinal function. And, since that 97% of the total population was female [23], it has been found that ovulation and menstrual cycles in female need a minimum level of stored, easily mobilized energy so that weight loss may cause severe results like loss of menstrual function (amenorrhea) [24]. Also, some data showed that there is a strong relationship between anxiety disorders and the state of AN. People with a history of AN or other subtypes of EDs who were not currently ill and never had a lifetime anxiety disorder diagnosis still tended to be anxious, perfectionistic, and harm avoidance [25].

More recent treatments for patients with AN are introduced gradually till this day, including FBT, adolescent focused therapy (AFT), cognitive behavioural therapy (CBT), family system therapy (FST), psychopharmacologic treatments and so on. Nowadays, FBT has the best evidence of efficacy and cost-effectiveness [26]. However, most of them are focused on professional therapies that required professions to operate and supervise. Those treatments mainly focused on two aspects in families, one is environment and the other is mental and physical. There are three major treatments from studies that we reviewed could help with adolescents AN, FBT, PFT [12], CRT [14]. In the causes of adolescents AN we already introduced that family is an effect of AN, FBT and PFT make a more detailed distinction in the factors of family.

Overall, we now have information of causes, impacts, and treatments of adolescent AN. Family influence, cultural differences, and environmental differences could

be triggers to result in adolescent AN. Adolescents with AN have physical impacts on their bodies, such as bones, and their brains. The functional Magnetic Resonance Imaging (fMRI) can show the differences between control groups (healthy people) and AN adolescent. Complications brought by adolescent AN, possible complications such as depression, anxiety, and physical dysfunction, could lead to social dysfunction, and the impact could be long-term.

We expected to find more studies for causes of adolescent AN, however, the aspects of adolescent AN are limited, one possible reason for limited findings of cause is that we set the time range between 2010 to 2021, there is not much more new research of causes for adolescent AN.

There is also a limitation in our review. Besides professional treatments for adolescent AN, we also searched for prospects of adolescents AN's personal cares in daily lives. The resources are also limited so that we did not fully meet our expectations.

We gathered studies' findings and contributions of adolescent AN in recent ten years, providing other scholars a conclusive achievement to do a similar study or foundation of further studies. Some sources are partial, there still are blanks of adolescent AN or AN in all ages. This paper could be a springboard to develop more ideas and researches.

5. CONCLUSION

Adolescents AN could be caused by family cultures, cultural differences, and also images on social media. AN triggers adolescents' bones and brains images change and complications to affect their body functioning and social functioning. Based on different causes of adolescents AN, some studies tested the efficiency of FBT, PFT, and CRT. These collected studies and results could be tools for other scholars and researchers to study and review, since we reviewed a lot of recent studies about adolescents AN, the data and technologies have been updated, so it is easier to avoid deficiencies and improve the accuracy and precision of other similar studies.

AUTHORS' CONTRIBUTIONS

We jointly collected all the materials referred in the paper and were responsible for the writing of different parts, and filled all tables together. Wang was mainly responsible the introduction, methods, and results. Liu finished abstract, discussion, and conclusion. Then we exchange the parts and revised.

REFERENCES

- [1] Herpertz-Dahlmann, B. (2009). Adolescent eating disorders: definitions, symptomatology, epidemiology and comorbidity. *Child and*

- adolescent psychiatric clinics of North America, 18(1), 31-47
- [2] Serpell L, Treasure J, Teasdale J, Sullivan V. 1999. Anorexia nervosa: friend or foe? *Int. J. Eat. Disord.* 25:177–86
- [3] Fairburn, C. G. , & Harrison, P. J. . (2003). Eating disorders. *Lancet*, 361(9355), 407
- [4] Haines, J., Kleinman, K. P., Rifas-Shiman, S. L., Field, A. E., & Austin, S. B. (2010). Examination of shared risk and protective factors for overweight and disordered eating among adolescents. *Archives of Pediatrics & Adolescent Medicine*, 164(4), 336-343
- [5] Du Montcel, C. T., Radjack, R., Rizzi, A. T., Moro, M. R., & Blanchet, C. (2021). Anorexic symptoms and experience of cultural mixing during adolescence: A qualitative study. *French Journal of Psychiatry*
- [6] Yao, S., Larsson, H., Norring, C., Birgegård, A., Lichtenstein, P., D’Onofrio, B., . . . Kuja-Halkola, R. (2021). Genetic and environmental contributions to diagnostic fluctuation in anorexia nervosa and bulimia nervosa. *Psychological Medicine*, 51(1), 62-69. doi:10.1017/S0033291719002976
- [7] Eklund Eklund, K., Vajapeyam, S., Feldman, H. A., Buzney, C. D., Mulkern, R. V., Kleinman, P. K., ... & Gordon, C. M. (2010). Bone marrow changes in adolescent girls with anorexia nervosa. *Journal of Bone and Mineral Research*, 25(2), 298-304
- [8] Mumford, J., Kohn, M., Briody, J., Miskovic-Wheatley, J., Madden, S., Clarke, S., ... & Munns, C. (2019). Long-term outcomes of adolescent anorexia nervosa on bone. *Journal of Adolescent Health*, 64(3), 305-310
- [9] Singhal, V., Tulsiani, S., Campoverde, K. J., Mitchell, D. M., Slaterry, M., Schorr, M., ... & Klibanski, A. (2018). Impaired bone strength estimates at the distal tibia and its determinants in adolescents with anorexia nervosa. *Bone*, 106, 61-68
- [10] Mainz, V., Schulte-Rüther, M., Fink, G. R., Herpertz-Dahlmann, B., & Konrad, K. (2012). Structural brain abnormalities in adolescent anorexia nervosa before and after weight recovery and associated hormonal changes. *Psychosomatic medicine*, 74(6), 574-582
- [11] Bühren, K., Schwarte, R., Fluck, F., Timmesfeld, N., Krei, M., Egberts, K., ... & Herpertz-Dahlmann, B. (2014). Comorbid psychiatric disorders in female adolescents with first-onset anorexia nervosa. *European Eating Disorders Review*, 22(1), 39-44
- [12] Le Grange, D., Hughes, E. K., Court, A., Yeo, M., Crosby, R. D., & Sawyer, S. M. (2016). Randomized Clinical Trial of Parent-Focused Treatment and Family-Based Treatment for Adolescent Anorexia Nervosa. *Journal of the American Academy of Child and Adolescent Psychiatry*, 55(8), 683–692. <https://doi.org/10.1016/j.jaac.2016.05.007>
- [13] Madden, S., Miskovic-Wheatley, J., Clarke, S., Touyz, S., Hay, P., & Kohn, M. R. (2015). Outcomes of a rapid refeeding protocol in adolescent anorexia nervosa. *Journal of Eating Disorders*, 3(1), 1-8
- [14] Timko, C. A., Bhattacharya, A., Fitzpatrick, K. K., Howe, H., Rodriguez, D., Mears, C., ... & Peebles, R. (2021). The shifting perspectives study protocol: Cognitive remediation therapy as an adjunctive treatment to familybased treatment for adolescents with anorexia nervosa. *Contemporary Clinical Trials*, 106313
- [15] Stormer SM, Thompson JK. 1996. Explanations of body image disturbance: a test of maturational status, negative verbal commentary, social comparison, and sociocultural hypotheses. *Int. J. Eat. Disord.* 19:193– 202
- [16] Striegel-Moore, R. H. . (1997). Risk factors for eating disorders. *Annals of the New York Academy of Sciences*
- [17] Minuchin S, Rosman BL, Baker L. 1978. *Psychosomatic Families: Anorexia Nervosa in Context*.Cambridge,MA:HarvardUniv.Press
- [18] Shoebridge P, Gowers SG. 2000. Parental high concern and adolescent-onset anorexia nervosa—a case-control study to investigate direction of causality. *Br. J. Psychiatry* 176:132–37
- [19] Ward A, Ramsay R, Treasure JL. 2000a. Attachment research in eating disorders. *Br. J. Med. Psychol.* 73:35–51
- [20] Vitousek KB, Hollon SD. 1990. The investigation of schematic content and processing in eating disorders. *Cogn. Ther. Res.* 14:191– 214
- [21] Klump K, McGue M, Iacono WG. 2000. Age differences in genetic and environmental influences on eating attitudes and behaviors in preadolescent and adolescent female twins. *J. Abnorm. Psychol.* 109:239–51
- [22] Polivy, Janet, Herman, & Peter, C. . (2002). Causes of eating disorders. *Annual Review of Psychology*

- [23] Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *British journal of psychiatry*, 170(3), 205-228
- [24] Frisch, R. E., & McArthur, J. W. (1974). Menstrual cycles: fatness as a determinant of minimum weight for height necessary for their maintenance or onset. *Science*, 185(4155), 949-951
- [25] Kaye, W. H., Bulik, C. M., Thornton, L., Barbarich, N., Masters, K., & Price Foundation Collaborative Group. (2004). Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *American Journal of Psychiatry*, 161(12), 2215-2221
- [26] Lock, J. (2019). Updates on Treatments for Adolescent Anorexia Nervosa. *Child and Adolescent Psychiatric Clinics*, 28(4), 523-535