

## ***Biomedical and sociobehavioral factors associated with anorexia nervosa in adolescents***

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### **ABSTRACT**

**Background:** Anorexia nervosa (AN) is a serious eating disorder with potentially fatal results. So far, however, the research data with regard to the factors for (AN) in youth are rather controversial, and there is no general agreement about their possible role in disease.

**Objective:** To determine the main biomedical and sociobehavioral factors associated with (AN) by providing an up-to-date synthesis of recent evidence. Research design. Brief review. Subjects. Adolescents.

**Material and method:** The material of the present study was exclusively Internet-based. As method we used the systematic search of the electronic literature via the PubMed and Google Scholar databases (in order to select relevant studies) using the search terms: “anorexia nervosa”, OR “anorexia”; AND b) “risk factors”; AND c) “adolescents”. Further articles were identified by citations in retrieved papers.

**Results and discussion:** Gender seems to be the main sociobehavioral risk factor associated with (AN). (AN) could affect individuals of all races and socioeconomic levels. Biomedical risk factors related to (AN) are shown to include psychiatric disorders, overtraining, early menarche or puberty, and insulin-dependent diabetes.

**Conclusions:** Better understanding of the biomedical and sociobehavioral factors for (AN) in adolescents could help in effective screening, prevention and early intervention strategies. Moreover, further etiologic research on (AN) focused on the interaction between biological and environmental influences and the underlying neurological mechanisms of (AN) is needed.

**Keywords:** Anorexia nervosa, risk factors, adolescents.

### **Citation**

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### **INTRODUCTION**

According to the ICD-10 Classification of Mental and Behavioural Disorders anorexia nervosa (AN) is “...a disorder characterized by deliberate weight loss, induced and sustained by the patient (...) associated with a

specific psychopathology whereby a dread of fatness and flabbiness of body contour persists as an intrusive overvalued idea, and the patients impose a low weight threshold on themselves. There is usually undernutrition of varying severity with secondary endocrine and metabolic changes and disturbances of

bodily function..” (Figure 1) [1]. The estimated average prevalence of (AN) is 0.3–1% in women and 0.1% in men in developed countries [2]. AN mainly bears upon adolescent females (girls between 15 and 19 years are about 40% of all cases), while almost 75% of individuals with (AN) are females [3]. The crude mortality rate for (AN) (CMR: the number of deaths over a specified period) has been estimated to 5.1 % per decade or 0.51 % per year [4]. Some researchers classify patients with (AN) into restricting (AN-R) and binge-eating/purging (AN-BP) subtypes. In any case, this approach has had limited utility in informing treatment development and given that most of the patients with (AN-R) eventually develop binge/purge behaviors, it could be considered that (AN-R) and (AN-BP) represent alternate phases in the course of illness rather than distinct subtypes [5]. However, despite the fact that (AN) is a very dangerous disorder, the research data regarding the potential factors that are associated with (AN) in adolescents are rather controversial, and there is no general agreement about their potential role in disease. These factors are of great significance

because without understanding their relationship to disease, effective screening, prevention and early intervention strategies would not be effective.

Factors that are associated with a pathological state can be generally classified into two major groups: biomedical and sociobehavioral. The term “sociobehavioral” factors (“social and behavioral”) should be understood as a shorthand term for the set of determinants involving human subjects not otherwise subsumed under the biomedical approach. It includes factors studied by the behavioral and social sciences; that is, anthropological, demographical, non-clinical-psychological, sociological, educational, economical etc. factors. Besides the fact that extensive research has been carried out on (AN), no single review study exists which adequately covers the factors for (AN) with regard to adolescents. The aim of the present study is to determine the biomedical and sociobehavioral factors associated with (AN) in adolescents and to add to existing knowledge by providing an up-to-date synthesis of recent evidence.

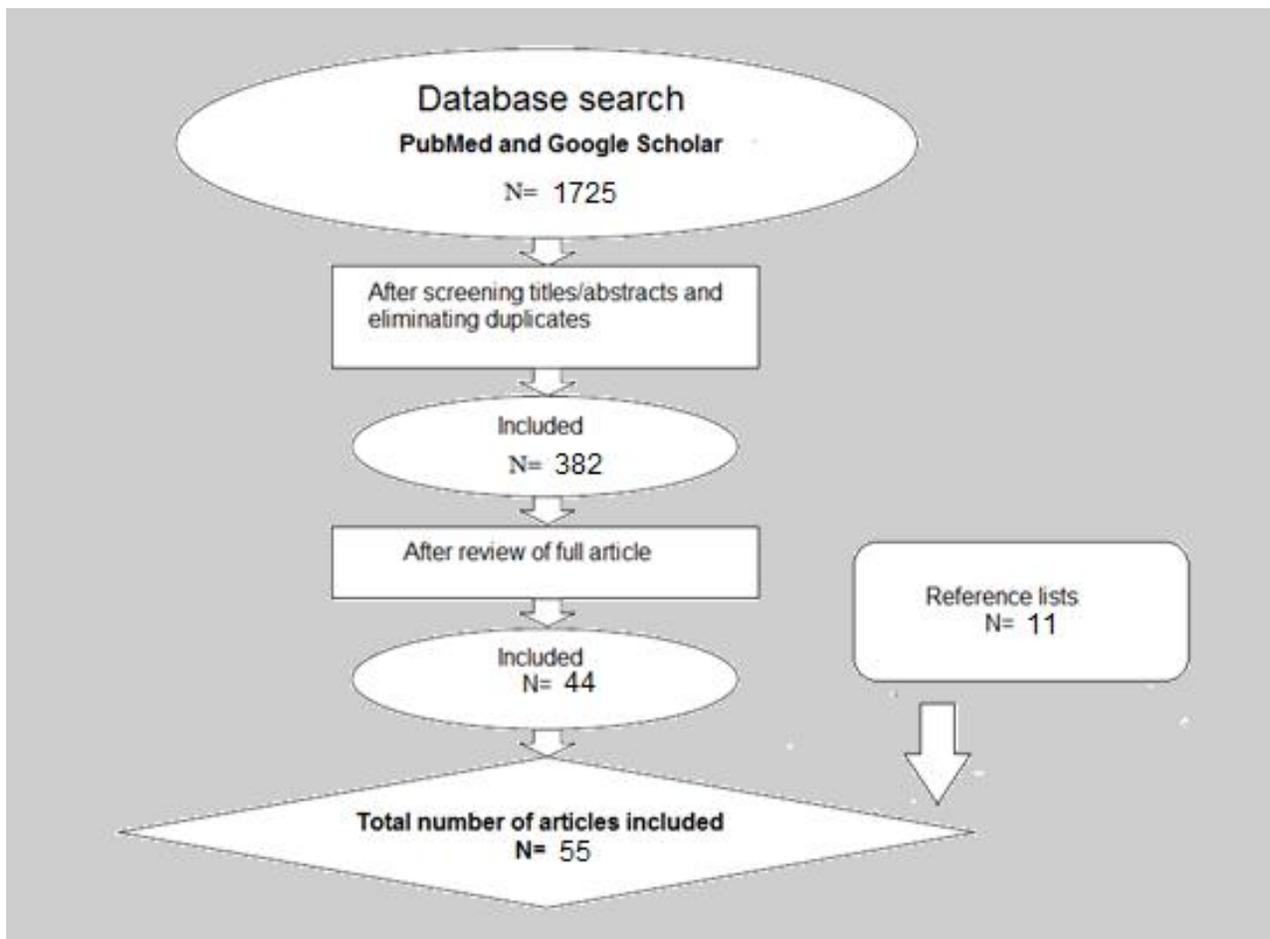


**Figure 1.** Some common characteristics of individuals with anorexia nervosa (according to ICD-10 Classification).

## MATERIAL AND METHODS

The material of the present study was exclusively Internet-based. As method we used the systematic search of the electronic literature via the official Web pages of PubMed and Google Scholar databases (Figure 2). The literature search was conducted from 10 January 2014 to 20 February 2014, including the terms: a)

“anorexia nervosa”, OR “anorexia”; AND b) “risk factors”; AND c) “adolescents”. Only articles in English were included. Articles that did not address the issues of interest for the brief review (not focused on biomedical and sociobehavioral risk factors or adolescents) were excluded. Data from the selected papers were synthesised thematically. In particular, search articles were analysed in terms of their content and their theoretical frameworks.



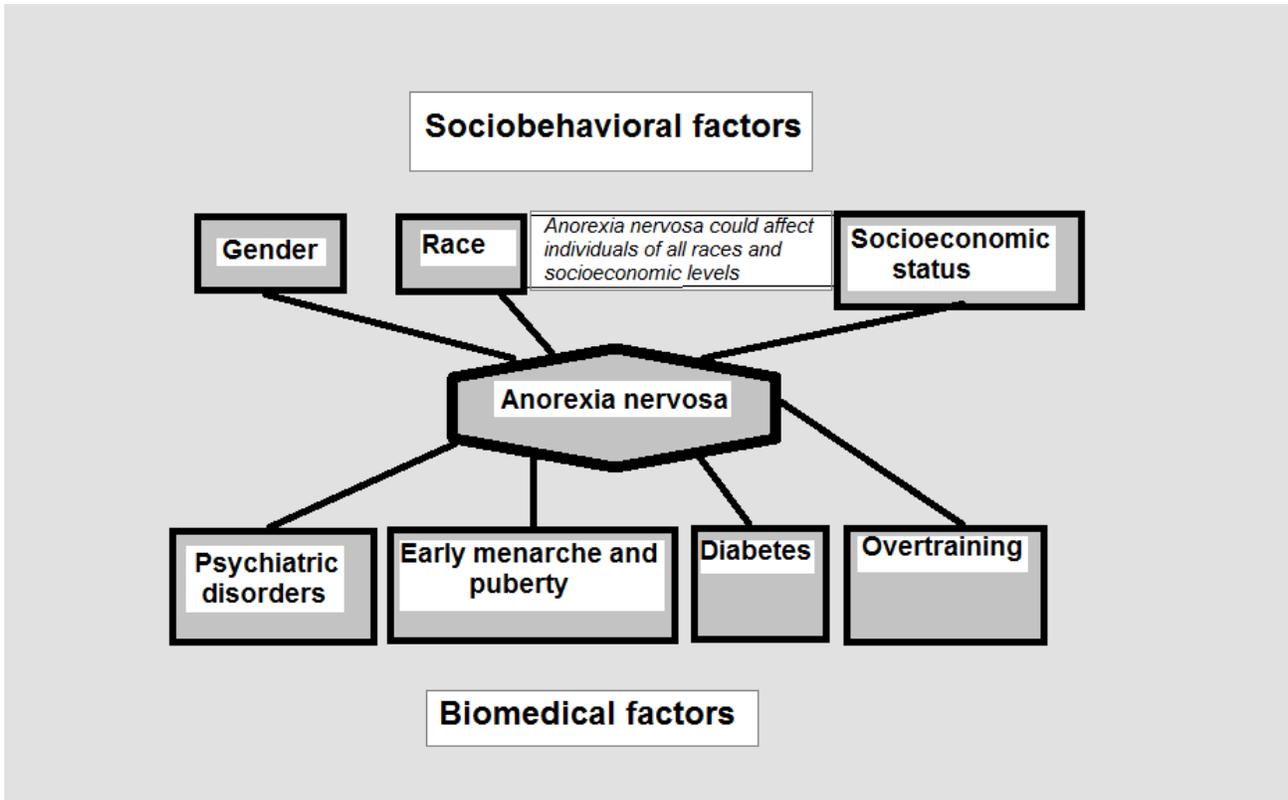
**Figure 2.** Flow of literature through searching and screening process

## RESULTS AND DISCUSSION

The major biomedical and sociobehavioral risk factors associated with (AN) in adolescents (according to the literature synthesis) are shown in Figure 3.

### *Gender*

The condition largely affects young adolescent females, with adolescents between 15 and 19 years old making up 40% of all cases. The average prevalence of (AN) has been



**Figure 3.** Factors associated with anorexia nervosa in adolescents

investigated mainly in samples of young females in Europe and North America, where the average point prevalence has been 0.3% [7]. Females are much more likely than males to develop (AN) (approximately 75% of people with anorexia are females) [8]. The lifetime prevalence among adult women has been reported as 0.5%–0.6% in 2 large population-based surveys in the United States [9] and Canada [10]; the latter study found a prevalence of (AN) among adult men of 0.1% [11]. However, another large population study in United States showed a higher proportion of men with (AN) in comparison with previous studies (lifetime prevalence estimates of (AN) were 0.9% among women, and 0.3% among men) [11]. It has to be noted that estimates from population-based studies for male (AN) are rather unstable because they involve small numbers of men [11]. Possible mechanisms underlying greater persistence of

morbidity in females could include sexual dimorphisms in brain neurotransmission, gender differences in attitudes regarding ideal body weight, and anxiety-related personality phenotypes associated with (AN) [12]. Moreover, it has been noted that thinness is a culturally, socially, and economically enforced requirement for female beauty. This imperative could make women vulnerable to cycles of dieting, weight loss and subsequent weight gain, which may lead to anorexia [13].

#### *Race and socio-economic status*

The view that eating disorders “affect mainly white women” [7,8] could be historically biased because the majority of research studies of subjects with (AN) have focused on Caucasian middle-class females. Nonetheless, (AN) could affect individuals of all races and socioeconomic levels. In an interesting study,

eighteen females of varying socio-economic status and race were interviewed and it was found that eating disorders [including (AN)] were frequently a response to environmental stress (i.e. abuse, poverty) in all ethnic groups [13,14]. Moreover, based on data obtained from the Minnesota Adolescent Health Survey among those young women who met psychiatric criteria for an eating disorder (in public schools), socio-economic status did not appear to be a significant factor [15].

### *Psychiatric disorders*

Although psychiatric disorders usually cannot be considered as risk factors for the development of (AN) [since -in many cases- the diagnosis of a psychiatric disorder follows the diagnosis of (AN)] it has been shown that specific mental, behavioral and neurodevelopmental disorders (not all of them) commonly co-occur with (AN). A synopsis of the main psychiatric disorders that commonly co-occur with (AN) in adolescents is shown in Figure 4.

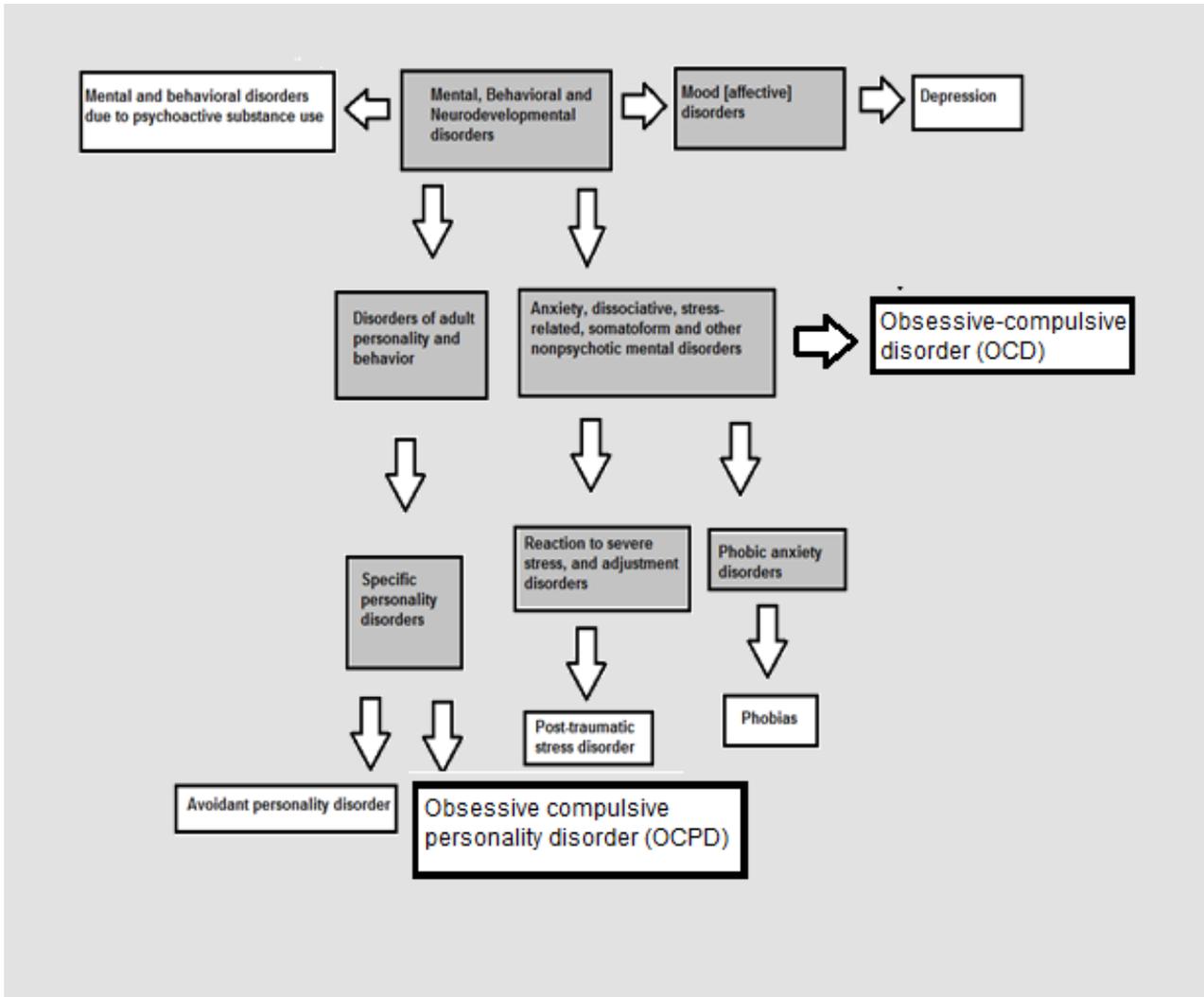
### *Avoidant personality disorder*

Research shows that avoidant personality disorder is relatively common in (AN) [17]. With regard to the personality subtypes, identity disturbances, and affective features of adolescents with anorexic disorders it has been shown that three personality subtypes are common: high-functioning/perfectionist, emotionally dysregulated, and overcontrolled, constricted [18]. Although its rates in the general population range between 0.5-1%, avoidant personality disorder is present in approximately 16-17% of people with (AN) [19]. Furthermore, a study which investigated the personality dimensions in adolescent patients with (AN) and contrasted them with the results of control females showed that adolescent patients scored

higher in persistence, harm avoidance and cooperativeness, and lower in novelty seeking and self-transcendence than control women. The deviations in temperamental profile of anorexic adolescents were similar to those reported in adult patients [20]. Furthermore, it has been shown that borderline personality disorder could be a risk factor for (AN) [21]. It is characterized by impulsivity, self-harm behavior (e.g., suicidal gestures, self-mutilating behavior), affective instability, chronic feelings of emptiness, and inappropriate anger [21]. In contrast to rates in the general population of 6%, borderline personality disorder is present in approximately 25 % of individuals with (AN) [21].

### *Obsessive-compulsive disorder*

Obsessive-compulsive disorder (OCD) is a psychiatric disorder in which patients present persistent, intrusive, senseless thoughts and impulses (obsessions) and repetitive, intentional behaviors (compulsions) [22]. At the clinical level it includes a range of characteristics with two major components: a) the intrusion of thoughts, ideas, or compulsions; and b) the resulting triggering of abnormal behaviors or rituals [23]. Several lines of evidence, including psychoneurobiological, pharmacological and epidemiological data, support the relationship between (AN) and (OCD) [24]. Results show a common genetic background in (AN) and (OCD); however, it is not clear whether (OCD) could cause (AN) directly or increase the susceptibility/vulnerability of a person to (AN) [24]. The prevalence of OCD has been estimated to be much higher in women with (AN) than in nonclinical groups in the community. About two-thirds of the individuals with eating disorders had one or more lifetime anxiety disorders; commonly



**Figure 4.** Classification [according to International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM, 2014)] of psychiatric disorders that might co-occur with anorexia nervosa in adolescents [16].

(OCD) [25]. Moreover, a hypothesis that (AN) is a phenomenological variant of (OCD) has been proposed. This approach considers (AN) as part of the (OCD) based on the fact that the risk for (OCD) is higher in families of patients with (AN) [26].

#### ***Obsessive-compulsive personality disorder***

Obsessive-compulsive personality disorder (OCPD) is a personality disorder characterized by a pervasive preoccupation with orderliness, perfectionism, and interpersonal control, beginning by early

adulthood at latest. (OCPD) is different and distinct from (OCD), which is a type of anxiety disorder [27]. The most significant difference between (OCD) and (OCPD) is the presence of true obsessions and compulsions in (OCD). Obsessions and compulsions are not present in (OCPD) [27]. In contrast to reported rates in the general population of 8%, (OCPD) is estimated to be present in approximately 22% of individuals with (AN) [21].

#### ***Post-traumatic stress disorder***

Research data indicate that past traumatic events tend to occur prior to the onset of (AN)

[28]. In a clinical study for estimating the frequency of traumatic events and comorbid post-traumatic stress disorder (PTSD) in women with (AN) it was found that 63.3% of the anorexic patients had experienced at least one trauma in their life, while 10% of the anorexic patients fulfilled the diagnostic criteria for (PTSD) [29]. However, in another study the prevalence of (PTSD) in clinical samples of individuals with (AN) had been estimated at 47% [30]. The significant difference between the results of these studies could be due to methodological issues; in any case the prevalence of (PTSD) in individuals with (AN) seems to be higher than in the general population (reported rates in the general population of 7.8%) [31].

### *Phobias*

Phobias (a subgroup of anxiety disorders, i.e. psychological and biological symptoms of anxiety are the core symptoms) have been considered as factors associated with (AN). A phobia is an irrational fear of specific objection, situations, activities or locations. Social phobia means that persons fear situations in which other persons might observe them [32]. Specific phobia, is an anxiety disorder characterized by increased and persistent excessive or irrational fear in the presence or anticipation of an object or phobic situation causing, almost invariably, an immediate anxiety response [33]. Social phobia, and specific phobia are common anxiety disorders in individuals with (AN). They usually have their onset in childhood - before the onset of (AN) - supporting the possibility they are a vulnerability factor for developing (AN) [25]. Shame has been identified as the key emotional symptom in social phobia, and it has to be regarded as important influencing factor in (AN) [34].

### *Depression*

Depression affects 11.2 % of 13 to 18 year olds in the United States at some point during their live [35], while the gender ratio for depression is approximately a 2:1 female-to-male ratio in adolescents [36]. It has been shown that (AN) and depression may co-exist, but the available published data (especially for adolescents) are limited [37]. In a clinical study of 84 patients with (AN), 56% were diagnosed with major depression [38]. Moreover, co-morbid depression was found in a clinical sample of 83 female patients with (AN) where 43% met criteria for major depression [39]. With regard to adolescents in an interesting case-control study 51 teenage cases with (AN) were compared with 51 age-, sex-, and school-matched cases with respect to premorbid developmental, physical, and psychiatric problems and comorbidity at the time of examination. Depressive symptoms were almost universal in the AN group, but it did not appear that such symptoms had preceded the (AN) [40].

### *Substance use*

It is estimated that 9 % of adolescent girls and up to 20 % of adolescent boys meet adult diagnostic criteria for an alcohol use disorder. Furthermore, the proportion of daily smokers among American high school seniors remains disturbingly high at about 20 % [41]. It has been hypothesized that the risk of incident cases of substance use in individuals with (AN) might be greater if one takes into account that the prevalence of drug and alcohol abuse is approximately 50% in individuals with an eating disorder, compare with a prevalence of approximately 9% in the general population [42]. However, there is a lack of clinical studies regarding the commorbidity of substance use in (AN) focusing on adolescents. In a study

which was performed so as to investigate the incidence of substance use in a clinical sample of adolescent girls diagnosed with either (AN) or bulimia nervosa it was found that the incidence of substance use for the group of anorexic girls was lower compared with the group of bulimic girls (18% vs 67%, respectively) [43].

### *Overtraining*

Overtraining (excessive exercise) is a well-known phenomenon in (AN) [44]. The prevalence of hyperactivity in (AN) lies between 31 and 80%, depending on the study and its criteria for hyperactivity [45]. Since excessive exercise has been associated with greater obsessiveness, it has been hypothesised that (AN) patients with excessive physical activity (hyperactive behavioural profile) constitute a subtype of the disorder with strong links to OCD [46]. Adolescents' compulsivity towards exercise is positively associated with different emotion regulation strategies [47]. The prevalence of (AN) is higher in female athletes than in male athletes, and more common among those competing in leanness-dependent and weight-dependent sports than in other sports [48]. With regard to the female athletes the term "female athlete triad" describes a serious clinical picture that affects adolescent female athletes and refers to the interrelationships among energy availability, menstrual function, and bone mineral density, which may have three main clinical manifestations: a) eating disorders, including (AN), b) functional hypothalamic amenorrhoea, and c) osteoporosis [49]. Of the few studies that include male athletes, some indicate an elevated risk for (AN) in male athletes competing in wrestling and rowing, and others show a lower risk for (AN) in male figure skaters and swimmers [48].

### *Early menarche and puberty*

Young women who had been early maturers have higher rates of lifetime history for psychosocial symptoms in comparison with women who were on-time maturers [50]. Although the etiology of phenomenon is not fully understood, there is evidence to suggest that the psychological response to normal pubertal increases in fatness and weight in the form of negative body image could have a role in promoting (AN) [51]. Moreover, males experiencing early puberty have a greater incidence of (AN) [52].

### *Insulin-dependent diabetes mellitus*

Increased prevalence of (AN) has been described in female adolescents with Insulin-Dependent Diabetes Mellitus (IDDM) as being almost twice as high as that found in their nondiabetic peers [53]. This condition is of particular concern because its association with impaired metabolic control and an earlier than expected onset of diabetes related complications [54]. Weight gain caused by insulin therapy, dietary restraint, and food preoccupation may predispose diabetic girls to develop a clinical or subclinical eating disorder [53]. Disordered eating habits (associated with impaired glycemic control) and weight management behavior are common; however, insulin misuse for the purpose of shape and weight control is not restricted to subjects with (AN) [55].

The present brief review study assessed and synthesized the research evidence so as to determine the potential factors that might be associated with (AN) in adolescents. However, it is important to note the methodological limitations of the studies involved in this review. There might be papers which have not been identified because they were not available electronically. Moreover,

there is a possibility that unpublished reports, doctoral theses, and studies that are not written in English may provide relevant research evidence, but they were not included.

The data from this study reveals several recommendations worthy of future study. First, large scale observational and intervention studies should be undertaken to clarify the probability of (AN) occurring given exposure to a particular factor in adolescents. Such studies will be the only way in which questions about the risk factors and comorbidities of (AN) will be answered. The identification of risk factors and comorbidities of (AN) could be an important part of : a) the clinical management of (AN) in adolescent patients, b) prevention (health education) programs that are implemented with adolescents and their parents before adolescents begin to experience the normative stressors that typically trigger the onset of

(AN). Additionally, further etiologic research on (AN) focused on the interaction between biological and environmental influences and the underlying neurochemical mechanisms of the disease is warranted.

## CONCLUSIONS

The findings of the present study indicate that biomedical and sociobehavioral factors associated with (AN) in adolescents include gender, specific (not all) psychiatric disorders, overtraining, early menarche or puberty, and diabetes, whereas (AN) could affect individuals of all races and socioeconomic levels. The identification of factors that increase the probability of (AN) occurring could help in designing preventive interventions that would reduce the risk and burden of (AN).

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## *Ιατροβιολογικοί και κοινωνικοσυμπεριφορικοί παράγοντες που σχετίζονται με τη νευρική ανορεξία σε εφήβους*

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### **ΠΕΡΙΛΗΨΗ**

**Εισαγωγή.** Η νευρική ανορεξία (ΝΑ) είναι μια σοβαρή διατροφική διαταραχή με δυνητικώς θανατηφόρα αποτελέσματα. Προς το παρόν, ωστόσο, τα ερευνητικά δεδομένα σχετικά με τους παράγοντες κινδύνου για τη (ΝΑ) στους εφήβους είναι μάλλον αμφιλεγόμενα και δεν υπάρχει γενική συμφωνία σχετικά με τον πιθανό τους ρόλο.

**Σκοπός.** Ο προσδιορισμός των ιατροβιολογικών και κοινωνικοσυμπεριφορικών παραγόντων που σχετίζονται με τη νευρική ανορεξία σε εφήβους μέσω της σύνθεσης πρόσφατων ερευνητικών δεδομένων. Σχεδιασμός έρευνας. Βραχεία ανασκόπηση.

**Υλικό και μέθοδος.** Το υλικό της παρούσας μελέτης αντλήθηκε αποκλειστικά από το διαδίκτυο. Ως μέθοδος χρησιμοποιήθηκε η συστηματική αναζήτηση της ηλεκτρονικής βιβλιογραφίας στις βάσεις δεδομένων PubMed και Google Scholar χρησιμοποιώντας τους όρους αναζήτησης : α) "νευρική ανορεξία", ή "ανορεξία", β) "παράγοντες κινδύνου" και γ) "έφηβοι". Επιπλέον άρθρα εντοπίστηκαν από τις βιβλιογραφικές αναφορές των αρχικώς επιλεχθέντων εργασιών.

**Αποτελέσματα και συζήτηση.** Το φύλο εμφανίζεται ως ο σημαντικότερος κοινωνικοσυμπεριφορικός παράγοντας που σχετίζεται με τη (ΝΑ), η οποία μπορεί να επηρεάσει άτομα από κάθε φυλή και κοινωνικοοικονομική κατάσταση. Οι ιατροβιολογικοί παράγοντες φαίνεται να περιλαμβάνουν ορισμένες (όχι όλες) ψυχιατρικές διαταραχές, την υπερβολική άσκηση, την πρόωμη εμμηναρχή/εφηβεία και τον ινσουλινοεξαρτώμενο διαβήτη.

**Συμπεράσματα.** Η καλύτερη κατανόηση των ιατροβιολογικών και κοινωνικοσυμπεριφορικών παραγόντων που σχετίζονται με την (ΝΑ) σε εφήβους μαθητές θα μπορούσε να βοηθήσει στον αποτελεσματικότερο έλεγχο, στην πρόληψη και στις πιο έγκαιρες στρατηγικές παρέμβασης. Μελλοντικά, περαιτέρω αιτιολογική έρευνα για τη (ΝΑ) εστιασμένη στην αλληλεπίδραση μεταξύ των βιολογικών-περιβαλλοντικών επιδράσεων και των υποκείμενων νευροβιολογικών μηχανισμών που εμπλέκονται στη (ΝΑ) είναι απαραίτητη.

**Λέξεις ευρετηρίου:** νευρική ανορεξία, παράγοντες κινδύνου, έφηβοι.

### **Παραπομπή**

***Ι. Δελημάρης. Ιατροβιολογικοί και κοινωνικοσυμπεριφορικοί παράγοντες που σχετίζονται με τη νευρική ανορεξία σε εφήβους. Επιστημονικά Χρονικά 2014;19(2): 118-131.***

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