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Ciências da Nutrição

Faculdade de Ciências da Saúde

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Eating disorders in adolescence: relation with food choices and future implications

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Resumo

Objetivo: Este trabalho tem como objetivo rever a literatura científica sobre os preditores dos distúrbios alimentares e explorar a forma como estas podem moldar as escolhas alimentares dos adolescentes e as suas implicações futuras.

Metodologia: Através de uma pesquisa na PubMed®, seguida de um método de identificação em bola de neve, foram identificados 79 estudos relevantes a serem incluídos.

Resultados: A adolescência é caracterizada como um período crítico em que ocorrem mudanças físicas, psicológicas e sociais, que podem tornar o indivíduo mais suscetível a desenvolver um distúrbio alimentar. As pressões sobre a imagem corporal, a aceitação social e os padrões de beleza da sociedade podem desencadear uma relação distorcida com a comida, bem como uma preocupação excessiva com o peso e a forma do corpo. Fatores genéticos, ambientais e psicológicos contribuem também para o aparecimento de distúrbios alimentares.

A anorexia nervosa, a bulimia nervosa e o transtorno de compulsão alimentar são os distúrbios alimentares mais prevalentes neste grupo etário, apresentando cada um deles sintomas e comportamentos distintos. Estes distúrbios têm consequências graves para a saúde física e mental dos indivíduos, afetando negativamente a sua saúde e qualidade de vida. No que diz respeito especificamente às escolhas alimentares, a evidência científica destaca diferenças significativas na ingestão energética, na distribuição dos macronutrientes e nos comportamentos alimentares entre indivíduos com diferentes distúrbios alimentares. Reconhecer estas variações e incorporá-las em planos de tratamento abrangentes pode contribuir para intervenções mais direcionadas e a melhores resultados para aqueles que enfrentam os distúrbios alimentares.

Conclusões: A deteção precoce e o tratamento adequado são essenciais para a recuperação e prevenção de complicações graves associadas aos distúrbios alimentares nos adolescentes. No entanto, é importante ter em conta os recursos limitados e a necessidade de uma avaliação abrangente dos programas preventivos, o que exige investigação e avaliação contínuas para melhorar as estratégias de prevenção e os resultados do tratamento. O objetivo final é melhorar a qualidade de vida destes jovens, proporcionando-lhes o apoio emocional, físico e psicológico necessário para

ultrapassarem os desafios relacionados com a doença e promoverem uma relação saudável com a comida e o corpo ao longo das suas vidas.

Palavras-chave: Distúrbios alimentares; Adolescência; Anorexia nervosa; Bulimia nervosa; Transtorno de compulsão alimentar; Escolhas alimentares; Saúde

Abstract

Aim: To review the scientific literature on the predictors of eating disorders and explore how these disorders can shape adolescent's food choices and their future implications.

Methods: A search on PubMed®, followed by a snowball identification method, identified 79 relevant studies to be included.

Results: Adolescence is characterized as a critical period when physical, psychological, and social changes occur, which may make the individual more susceptible to developing an eating disorder. Pressures on body image, social acceptance, and societal standards of beauty can trigger a distorted relationship with food as well as excessive concern with body weight and shape. Genetic, environmental and psychological factors contribute to the onset of eating disorders.

Anorexia nervosa, bulimia nervosa and binge eating disorder are the most prevalent eating disorders at this age group, each presenting distinct symptoms and behaviors. These disorders have serious consequences for the physical and mental health of the affected individuals, negatively affecting their health and quality of life. Regarding specifically food choices, the evidence highlights the significant differences in caloric intake, macronutrient composition, and eating behaviors between individuals with different eating disorders. Recognizing these variations and incorporating them into comprehensive treatment plans may contribute to more targeted interventions and better outcomes for those facing eating disorders.

Conclusions: An early detection and adequate treatment are essential for the recovery and prevention of severe complications associated with eating disorders in adolescents. However, it is important to take into account the limited resources and the need for comprehensive evaluation of preventive programs, which requires ongoing research and evaluation to improve prevention tactics and treatment outcomes. The ultimately goal is to improve the quality of life for these young people by providing them with the emotional, physical, and psychological support needed to overcome the challenges related with the disease and to promote a healthy relationship with food and body throughout their lives.

Key words: Eating disorders; Adolescence; Anorexia nervosa; Bulimia nervosa; Binge eating disorder; Food choices; Health

Abreviaturas

EDs - Eating Disorders

BED - Binge Eating Disorder

DSM-5 - Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

QEWP - Questionnaire on Eating and Weight Patterns

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1. Introduction

Eating disorders (EDs) are a diverse group of mental health conditions that include abnormal eating habits or eating behaviors that disrupt the consumption or absorption of food (1) and negatively impact physical and mental well-being (2). EDs are one of the three most common chronic illnesses among adolescents, along with asthma and obesity (3). Binge eating disorder (BED), bulimia nervosa and anorexia nervosa are EDs commonly diagnosed in adolescents. Binge eating refers to a pattern of eating where a person consumes an excessive amount of food within a short period of time, feeling unable to control eating during this time (4). This behavior is often seen in individuals with other EDs, particularly those with bulimia nervosa (4). Bulimia nervosa is in fact a type of ED characterized by recurrent episodes of binge eating, followed by inappropriate behaviors aimed at preventing weight gain, such as self-induced vomiting, laxative or diuretic abuse, or excessive exercise (2). Individuals with bulimia nervosa are preoccupied with body shape and weight and may experience intense feelings of guilt, shame, and self-disgust after binge eating episodes (2). On the other hand, anorexia nervosa is a condition characterized by a significant restriction of food intake, leading to unhealthy body weight (2). Additionally, individuals with anorexia nervosa often experience a persistent and intense fear of gaining weight, as well as a distorted perception of their body shape or size (2).

According to the Global Burden of Disease, it has been estimated that around 9 million people worldwide suffered from an ED in 2019 (5). Estimates indicate that while men account for roughly 10% of cases, women experience EDs at a higher prevalence, being the most affected gender (with a female-to-male ratio of 6 to 1) (6). In men, BED is more common than anorexia nervosa and bulimia nervosa (7). Although EDs can occur at any age, they often emerge during adolescence and early adulthood, with each specific ED having a different peak age of onset (7). In particular, bulimia nervosa as an age of onset as early as 13 years old (7).

Adolescence, characterized by rapid physical and cognitive development, is considered a critical period for the development of EDs. Different risk factors for developing persistent EDs in adolescence have been identified, including concerns about weight, body dissatisfaction, excessive focus on preventing weight gain, unhealthy weight control behaviors, depression, food-related parenting practices, disrupted family

cohesion, and exposure to media influences (8). Weight and body dissatisfaction are important risk factors for eating disorders, but we cannot neglect that these appear in adolescents regardless of their initial weight (9).

EDs have been associated with several negative outcomes in terms of health, quality of life, and even mortality (10,11). Adolescents with EDs are at risk for developing cardiovascular, gastrointestinal, endocrine, neurological, renal, and psychological related problems (6). Anorexia nervosa has a mortality rate of 5% to 6%, being the highest among psychiatric illnesses (6). Mortality for bulimia nervosa is estimated to be around 2% and individuals with bulimia have a higher risk of lifetime suicidality and suicide attempts (6).

Given that adolescence is a vulnerable time for the development of EDs, it is crucial to be aware of the potential for its onset during this period. An early detection and treatment can greatly improve outcomes for adolescents with EDs (12). Studying EDs is of utmost importance because it enables a better understanding of the many aspects that influence their development, particularly for those which have the greatest impact, and are modifiable. We may also better comprehend the complex interactions among biological, psychological, and social factors that affect EDs. Additionally, research on EDs fosters empathy among the public, educators and healthcare professionals by promoting awareness and lowering stigma.

This work aims to review the scientific literature on the predictors of EDs and explore how these disorders can shape adolescent's food choices and their future implications. Ultimately, it aims to answer the question: How EDs are developed during adolescence and how they can impact future life?

2. Methodology

To find relevant studies for this narrative review, we conducted a search on PubMed® and employed a snowball identification method. The search expression used was: ((Feeding and Eating Disorders) OR (Eating Disorders)) AND (diet* OR obesity). In order to search for more up-to-date findings, only papers from the past 10 years were included. Additionally, filters were applied regarding the age of participants (only adolescents from 13 to 18 years old were included), the language (Portuguese and

English), and specie (only studies conducted in humans). The initial search in the database identified a total of 1,837 scientific papers. These papers were imported to Excel and were screened to assess their potential eligibility. A flowchart of papers' inclusion and exclusion was developed (Figure 1). Several papers were excluded because they were focused in unhealthy populations, such as adolescents with diabetes, dysglycemia, bipolar disorder, schizophrenia spectrum disorders, or in specific populations namely undergraduate nutrition students and dietitians, pregnant teens in Southern Brazil, vegan and vegetarian adolescents. A total of 79 studies were included in this narrative review.

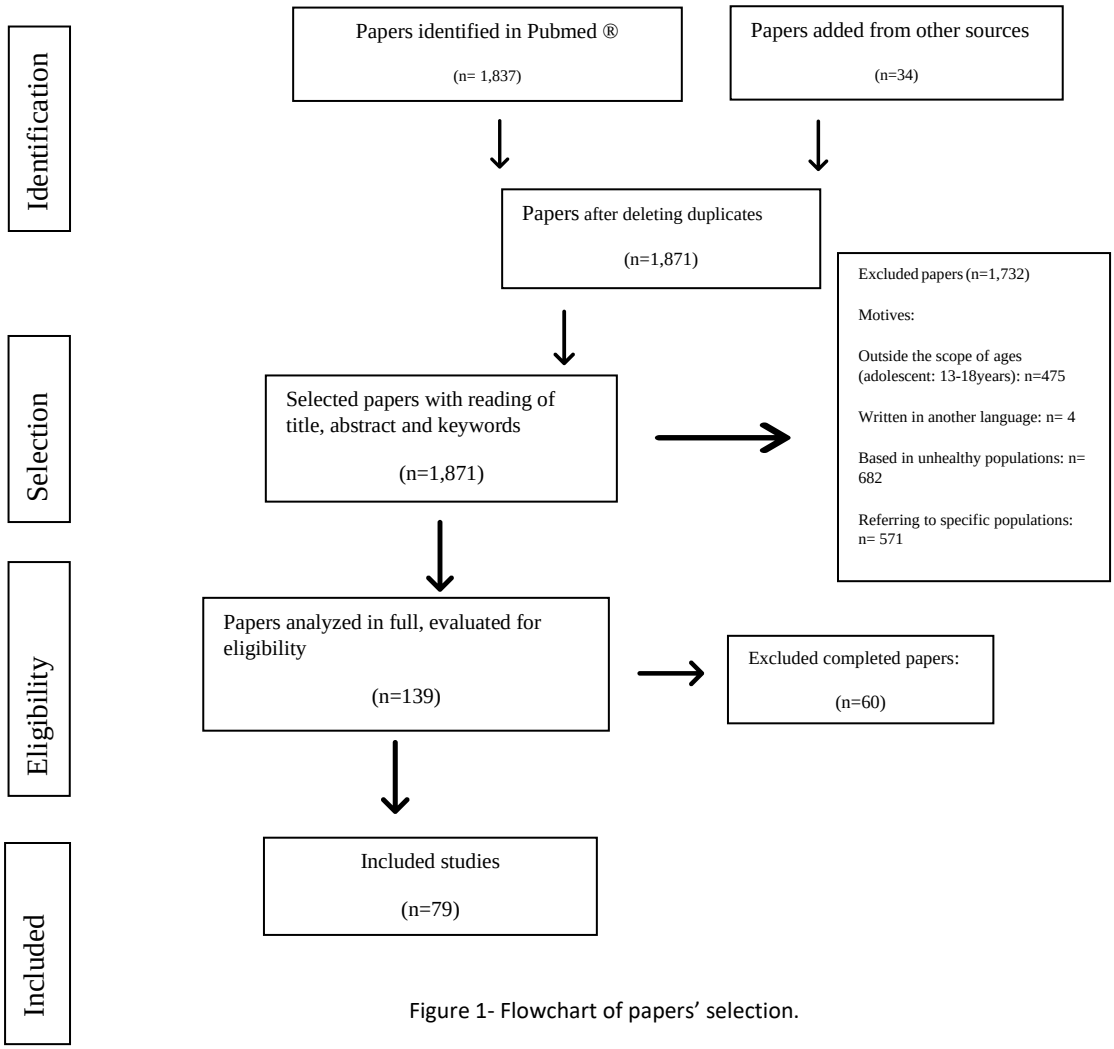

Figure 1- Flowchart of papers' selection.

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3. Understanding Eating Disorders: Classification and Symptoms

According to the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), the main diagnostic guide used by mental health practitioners, EDs are

classified as mental health disorders (2). Distinct EDs are recognized by the DSM-5, including BED, bulimia nervosa and anorexia nervosa.

Binge eating refers to a pattern of eating where a person consumes an excessive amount of food (bigger than most individuals would eat under identical conditions) within a short period of time and feels unable to control eating during this time (13). BED is a disorder defined by the recurring occurrence of binge eating episodes, which are followed by a variety of related symptoms. These characteristics may include distress connected to binge eating, as well as behaviors such as eating in secret or consuming food even when not hungry, eating much more rapidly than normal, eating until feeling uncomfortably full, feeling disgusted with oneself, depressed, or very guilty after overeating (13). Individuals with eating problems, especially those with bulimia nervosa, frequently exhibit this behavior, however, in contrast to bulimia nervosa, binge eaters do not consistently engage in purging behaviors such as self-induced vomiting or laxative use. There are several obstacles when identifying BED symptoms. The most significant ones are that individuals may be ashamed to share their eating habits with medical professionals and that professionals do not routinely test for this behavior (4). Treatment typically includes psychotherapy, nutritional counseling, and supportive groups (2).

Bulimia nervosa is a complex disorder that is characterized by recurrent episodes of binge eating, frequently followed by compensatory behaviors to prevent weight gain, such as self-induced vomiting, laxative, diuretic abuse, or excessive exercise (14). This disorder involves disordered eating habits and is characterized by irregular adherence to dieting, such as "on" and "off" diet days. Some days are focused on maintaining a healthy eating pattern, while others are dominated by compulsive eating habits that lead to overeating and trigger negative feelings (15). Individuals with bulimia nervosa are particularly preoccupied with body shape and weight and may experience intense feelings of guilt, shame, and self-disgust after binge eating episodes. Diagnosis usually entails a comprehensive examination of symptoms, medical history, and psychological variables. Treatment usually involves a mix of psychotherapy, medication, and dietary advice. Long-term assistance and monitoring may also be required to prevent recurrence (2).

Anorexia nervosa is a condition characterized by a significant restriction of food intake, leading to a body weight that is lower than what is considered healthy for a person’s age, sex, and height. Additionally, individuals with anorexia nervosa often experience a persistent and intense fear of gaining weight, as well as a distorted perception

of their body shape or size that makes them lose the ability to interpret the severity of the significant weight loss (16). To avoid weight gain, individuals may engage in behaviors, such as calorie tracking, intense exercise, portion sizes control, and obsession with the type of food they eat, all of these are restrictive behaviors (17).Detailed review of symptoms, medical history, and psychological variables are often used to make a diagnosis. Treatment usually involves weight gain, which in more extreme cases is done in a hospital environment, psychological help and treatment of complications resulting from malnutrition (18). To avoid recurrence, long-term assistance and monitoring may be required (2).

Other specified feeding or eating disorders (DSM-5: OSFED) are classified as a group of EDs that do not meet all of the criteria for BED, bulimia or anorexia nervosa. However, due to the similar characteristics and consequences they are also part of the group of EDs (2). For practical reasons, in this narrative review, only BED, bulimia nervosa and anorexia nervosa will be explored in more detail.

3.1 Methods and Challenges in Assessing Prevalence and Associated Symptomatology of Eating Disorders

Understanding the prevalence and diagnostic criteria of EDs is crucial for developing effective prevention and treatment strategies. It is important to highlight that due to their low frequency and patients' tendency to conceal their disease, the actual EDs prevalence may be underestimated. It is widely believed that EDs are more common than what is indicated by research, often based on self-reporting methods. Several studies rely on useful, but constrained data from hospital or psychiatric case registers. Cases that do not seek treatment might be missed by these records, also affecting the estimation of the true occurrence of EDs. For a more comprehensive knowledge of EDs epidemiology and their effects on the general population, a comprehensive approach incorporating several data sources is required (19).

It is difficult to diagnose binge eating episodes, especially in adolescents. Challenges include determining the exact definition of a large amount of food, as it may not be always easy to visualize and interpret. In addition, adolescence is a developmental phase characterized by the occurrence of growth spurts, which can contribute to variations

in caloric needs and intake (20). Also, the perception of loss of control and excessive consumption is not always correctly interpreted or well perceived (21). To accurately identify an eating episode as a binge, it may be necessary to conduct clinician-expert interviews rather than relying solely on self-reported information. Self-reported food intake is not always a reliable measure of actual intake. Using verbal descriptions or pictures of food portions may help improve the accuracy of assessments (13).

For bulimia nervosa, the validity of some criteria for diagnosis has been called into question, such as the idea that episodes of binge eating involve the consumption of a larger amount of food than most people would eat. However, this concept can be difficult for patients to quantify and understand, so they may instead categorize their episodes based on their perceptions (22).

The clinical evaluation for diagnosing anorexia nervosa includes a complete medical history (family and social history, medications including non-prescription, and past medical and psychiatric history). In addition, a physical examination is also part of the process (which helps to look for complications mentioned above). Laboratory tests are another integral part of the process and include a coagulation panel, complete blood count, complete metabolic profile, 25-hydroxyvitamin D, testosterone (for men), thyroid stimulating hormone, and urine test (beta-hCG [women] and illicit or prescription drugs). For patients with arrhythmias, an electrocardiogram is performed, and for cases where the body mass index is less than 14 kg/m^2, more tests may be necessary to perform (10).

Besides clinical diagnosis, there are population-based tools that may identify symptomatology associated with EDs. Population-based studies provide valuable insights into the epidemiology of EDs. To accurately evaluate the prevalence and severity of EDs in a population, a variety of methods have been developed, including self-report questionnaires and clinical interviews (23). The assessment of signs and symptoms associated with EDs is commonly evaluated by standardized scales. While these scales do not allow a clinical diagnosis, they can provide valuable information about the presence and severity of ED symptoms in a given population (23).

Different tools have been described in the literature, namely the Eating Disorders Inventory (EDI), which is based on a 64-item self-reported multiscale measure that can assess psychological and behavioral trait characteristics of anorexia nervosa and bulimia nervosa. This tool uses 8 subscales that measure: 1) Drive for Thinness, 2) Bulimia, 3)

Body Dissatisfaction, 4) Ineffectiveness, 5) Perfectionism, 6) Interpersonal Distrust, 7) Interoceptive Awareness and 8) Maturity Fears (24). The score for each question is evaluated on a Likert scale, where patients are asked to indicate the frequency or intensity of their agreement with several statements. After the scores are calculated, the results provide information about the presence and severity of ED symptoms (24). For the development of this tool, data were collected from a large sample of individuals who had been previously diagnosed with anorexia nervosa or bulimia nervosa. Through extensive item generation and refinement, the researchers created a large and comprehensive inventory that encompassed different aspects of EDs including cognitive, behavioral, and emotional factors (25). The main goal was to get a clear picture of the complexities and characteristics of the disease. After having the inventory, the researchers set out to analyze its reliability and validity. The results obtained indicated strong psychometric properties which lead to the inventory being a reliable and valid tool to assess anorexia nervosa and bulimia nervosa (25).

The Questionnaire on Eating and Weight Patterns - revised (QEWP-R) is another tool that is able of measuring symptoms of BED. This tool underwent changes when binge eating was considered an ED and included into the DSM-5. Therefore, this tool was revised to be able to meet the new diagnostic criteria and the QEWP-5 was created as a screening tool to be used in clinical practice or as a mean of research (26). A 16-item questionnaire was create by Spitzer and his colleagues in co-authorship with the Eating Disorders Task Force of the American Psychiatric Association and included the following main modifications: 1) revision of the frequency of binge eating and compensatory behaviors; 2) revision of the threshold for inappropriate compensatory behaviors - exclusion criteria; 3) removal of some questions that were not related to the diagnostic criteria; 4) incorporation of questions to assess subjective binge eating (loss of control when eating in the absence of consumption of a large amount of food); and 5) revision of the decision rules for diagnosis (26). This questionnaire has been administered by self-report or telephone in a variety of settings such as university and commercial weight-loss clinics, self-help groups, and community settings (27). In addition, some researchers complemented the tool so that it would be able to capture episodes of loss of control over eating when these do not involve the consumption of an objectively large amount of food, being loss of control one of the fundamental characteristics of BE, this adaptation became very useful (27).

The SCOFF questionnaire is another tool used to identify individuals at risk of suffering from EDs (28). It is a screening tool for eating disorders, and what distinguishes it from the previous ones is its simplicity and speed of application, consisting of only 5 simple "yes" or "no" questions focused on capturing the main aspects of eating behaviors and attitudes associated with them (28). The brevity and simplicity of the tool allows it to be easily applied in a variety of healthcare settings such as primary care, schools, or community clinics. not requiring specialized training or qualifications to administer/use. Not being a diagnostic tool, its objective is to clearly and quickly identify individuals who may benefit from a more complex evaluation for EDs (29). If the patient answers positively to two or more questions, then this is indicative of a potential ED and further evaluation is required. The 5 questions are the following:

1. Do you make yourself Sick because you feel uncomfortably full?
2. Do you worry you have lost Control over how much you eat?
3. Have you recently lost more than One stone (14 pounds) in a three-month period?
4. Do you believe yourself to be Fat when others say you are too thin?
5. Would you say that Food dominates your life?

Extensive research and testing was used to ensure the reliability and validity of the questionnaire. Data was collected from a sample of individuals with EDs and compared to a control group, and statistical analysis was used to assess the sensitivity and specificity of the tool (28).

Many other tools are available in the literature to identify symptomatology associated with EDs (30). However, as mental health disorders, their medical diagnosis implies mandatory extensive clinical evaluation.

4. Prevalence, Remission, and Risk of Relapse of Eating Disorders

EDs are, in general, more common in female patients, but males account for 10% of cases, with an estimate female to male ratio of 6 to 1 (6). The prevalence of BED is estimated to be around 3.3% among women and 0.8% among men, according to the DSM-5. It is also recognized that BED is most commonly diagnosed in adolescence and early adulthood, although it can occur at any age (2,31). In terms of prevalence, anorexia

nervosa is more common in women than in men (32), and has a lifetime prevalence of 0.5% to 2%, with a peak age of onset between 13 and 18 years. Bulimia nervosa has an age of onset between 16 and 17 years. Prevalence is also higher in females and reaches about 1% to 1.5% of the population (2).

According to recent epidemiological studies, EDs are increasing, especially among younger children, boys, and minority groups (19).

In this type of pathologies, achieving total recovery is always the main goal, but it is not always easy to reach, and for this to go through, a process of remission is very important. Remission in this particular context refers to a significant decrease in the symptoms of the disease as well as the episodes that characterize it, including restrictive eating, purging and binge eating. As explained, remission is not the same as a full recovery whereby some residual symptoms may persist, however, it is important because it is a journey toward achieving full recovery. There is not only one way to the remission road, in EDs it all depends on the individual and their specific needs, but commonly involves the following factors: Treatment; Self-Care; Social Support; Lifestyle Changes; Maintenance (23,33).

According to a study, conducted in a cohort of Danish eating disorder patients with seventy-eight patients (30 bulimics, 35 anorexic and 13 unspecified eating disorder patients) (33), it took an average of 26,95 months (ranging from 3 to 30 months) to achieve remission, with a noticeable difference between the various diagnostic group. This observation is consistent with more recent studies (34,35), which have reported that patients with bulimia nervosa tend to achieve remission faster than those with anorexia nervosa. However, along with remission is the risk of relapse, and the previous study also shows that those who achieve remission the fastest are the ones who are most likely to relapse the soonest (33). The relapse rate is especially high for anorexia and bulimia nervosa, making it achieve numbers up to 30-40% (33).

EDs are usually treated by a multidisciplinary team that may include: a psychiatrist, nutritionist, social worker, internist, endocrinologist, gastroenterologist, and nurses so that they can respond to all the specificities of the disease. EDs can be avoided and/or treated, when everyone works together. The nutritionist takes care of the dietary education of the patient and their family as well as the fact that physical exercise is important however when it is extreme it can be dangerous. The psychology team is

responsible for working on the behavioral part, working on emotional issues, stress, body image, and frustrations. The medical team must educate on the correct use of drugs to avoid the use of laxatives and diuretics for weight loss. Only with continuous monitoring and follow-up can patient outcomes be improved (18).

5. Determinants of Eating Disorders

EDs can be influenced by various determinants, organized into four main categories: biological, psychological, environmental, and social (5).

Biological determinants involve factors such as genetic predisposition, abnormalities in brain chemistry, and medical conditions affecting hormones and neurotransmitters. The scientific evidence to date supports the theory that individuals with a family history of EDs or other mental health conditions may be more susceptible to developing an ED (36).

Psychological determinants can include some of the symptoms like low self-esteem, perfectionism, anxiety, depression, and trauma (37). Individuals with EDs may use food and eating behaviors as coping mechanisms for emotional distress and personal problems (37).

Environmental determinants depend heavily on the cultural milieu in which individuals are situated, as well as their geographic region, customs, socioeconomic status, diversity within families, and background. Some of the factors to consider are the cultural pressure exerted by society for individuals to conform to certain unrealistic beauty standards, dysfunctional family structure, deprived social environment, exposure to media images that promote thinness as an ideal, and the influence of family and peers (38).

Social determinants involve peer pressure, social isolation, media influence, and the pressure to attain a specific body image. Individuals who suffer from an ED often have low self-esteem, which leads them to seek validation from others and the society (39). Furthermore, adolescence being such an influential stage, the presence of social networks and the influence that the media has through unrealistic beauty standards and idealization of bodies can significantly impact the way the adolescent perceives his body and the expectations it puts on him, contributing to the development of wrong thoughts and unregulated eating behaviours (40,41).

Additionally, there are key factors associated with the development of EDs in adolescence associated with weight management, including weight concerns, body dissatisfaction, and unhealthy weight control behaviours (2,42).

Moreover, studies have shown a strong association between obesity and EDs, particularly binge eating. The empirical evidence showed that the prevalence of binge or loss of control eating episodes in obese adolescents was between 36,5% and 45% (43). Excess weight caused by unregulated eating habits promotes altered eating episodes and a negative relationship with food that often leads to the development of binge eating episodes that trigger several episodes of binge eating (44). Indeed, obese adolescents are at greater risk of developing EDs compared to their non-obese counterparts (45). Experiencing cyclical moments of weight gain and loss contributes to the development of unbalanced eating patterns.

Negative body image, related to shame for one's appearance and particular concern for what others think of one's appearance, was found to be among the strongest predictors of binge eating (46). Women are significantly more affected by symptoms such as body image distortion, loss of control over eating, and deliberate vomiting compared to men who show increased scores in the compensatory exercise category (47).

In adolescents who feel that they are somewhat or significantly overweight, body dissatisfaction promotes some feelings such as shame, anxiety, and sadness and this may be a precursor to the future development of obesity or overweight (48), since this motivates the involvement in spirals of negative and unhealthy behaviors that can trigger moments of binge eating (49). These are often behaviors of refuge to escape the negative thoughts associated with the dissatisfaction felt with the body itself, which often manifests itself in the ingrained idea of beauty associated with the thin body (50). Body dissatisfaction, desire for thinness, and a distorted impression of one's own weight are all factors that are frequently related to excessive weight management measures in adolescents (51).

6. Consequences of Eating Disorders: Physical and Mental Health Implications

A range of physical and mental health complications may arise from EDs. They can result in several serious health complications such as malnutrition, cardiometabolic and gastrointestinal alterations, and hormonal imbalances (31), but also mental health

consequences, such as anxiety and depression, body dissatisfaction and social isolation (44). Some of the most important physical and mental health implications of EDs will be described briefly.

- **Food and nutritional intake:** Evidence shows that individuals with anorexia nervosa eat significantly fewer calories per day than healthy control groups. The average daily intake of an individual with anorexia nervosa is on average 1,285 kcal which is clearly less than the average daily intake of the control group (1,532 kcal per day) (52). In terms of macro and micro nutrient intake, there is a clear tendency of anorexia nervosa patients to consume significantly fewer calories from fat and more calories from protein than healthy comparison participants. Total calcium, zinc and iron intakes are shown to be higher due to frequent use of dietary supplements, as well as for vitamin D, A and K (53).

  For bulimia nervosa and BED, the evidence suggests that caloric intake during a binge eating episode is higher than the binge episodes of normal weight or obese individuals. The recorded caloric intake during binge eating episodes is around 2,482 kcal for bulimia nervosa and 2,048 kcal for BED, according to a study conducted in ten obese women with BED and 10 weight-matched women without BED, each one ate a multi-item meal supper identical to those used in prior bulimic experiments, while an experimenter recorded the individuals' food selections every 10 seconds through closed-circuit video. (54). Studies have yielded mixed results regarding the proportion of calories consumed from protein during binge eating episodes, with some showing higher proportions for BED subjects compared to obese controls, while others show the opposite (55). Other study supports the idea that in binge eating episodes the proportion of calories consumed from dairy and fat is higher (56). These distinct results can be explained by the small size of the sample group, but we can still assume that these episodes of ED are not directly associated with a specific macronutrient group. For bulimia nervosa, there is a higher calorie intake from carbohydrates, sucrose and fat and a lower protein intake compared to healthy control groups. There is a tendency to have a higher consumption of snacks and desserts in times of eating dyscontrol compared to normal days where vegetable consumption is more prevalent (57).

  The evidence shows that in moments of binge eating in both bulimia nervosa and BED there is a tendency to consume salty snacks and desserts. Individuals with

bulimia nervosa are significantly more likely to skip meals, especially breakfast and lunch compared to normal controls, and to individuals with BED. Meal skipping and nighttime snacking were positively associated with increased frequency of binge eating episodes for BED subjects, but had no association with binge eating and purging episodes in bulimia nervosa subjects (54).

In addition to the above, through clinical observations that were supported empirically through retrospective and prospective self-report surveys and interviews, it was possible to find other behaviors in anorexia nervosa and bulimia nervosa patients including fluid restriction or overconsumption, aberrant preference for sweet-tasting foods, excessive consumption of caffeine, sugar-free soft drinks, and artificial sweeteners (54).

- **Malnutrition**: Particularly associated with anorexia nervosa due to restrictive food intake behaviors can result in deficiencies of essential nutrients, vitamins, and minerals. Organ function, the immune system, and overall health may be compromised (58).
- **Electrolyte Imbalances**: Purgatory behaviors, inappropriate eating habits, or the abuse of diuretics, common in bulimia nervosa, can affect the electrolyte levels in the body. This alteration may be responsible for the development of dehydration, irregular heartbeat (arrhythmia), muscle weakness, and even cardiac arrest (2).
- **Gastrointestinal alterations**: Frequent episodes of binge eating followed by compensatory behaviors, as seen in bulimia nervosa, can cause gastrointestinal problems and these may include acid reflux, stomach ulcers, constipation, and damage to the esophagus (2).
- **Dental Complications**: The frequent vomiting that is characteristic of bulimia nervosa promotes the corrosion of tooth enamel because there is frequent exposure to gastric acid. This can lead to the development of caries, sensitivity, and gum disease (59).
- **Hormonal Imbalances**: It is common in women to observe unregulated menstrual cycles, or in more severe cases, a loss of the menstrual period (amenorrhea). In addition, pregnancy complications and the risk of miscarriage are increased for women with EDs. For males, hormonal imbalances can result in reduced testosterone levels, sexual dysfunction and reproductive difficulties (58,60).

- **Obesity-Related Health Issues**: Obesity is clearly connected with EDs, generating several somatic problems and increasing some risks of developing diseases. EDs, such as binge eating, coexist with diseases such as overweight, diabetes, and celiac disease. Evidence shows that disordered eating behaviors in childhood and adolescence increase the likelihood of developing overweight and obesity in adulthood (42). Other study highlights that particularly binge eating can often trigger or increase the likelihood of developing obesity (61). BED does not only affect body weight, but also significantly increases the risk of various health complications. Individuals with BED are at a higher risk of experiencing cardiovascular disease, type 2 diabetes, high blood pressure, and certain cancers (61).
- **Anxiety and Depression:** EDs are psychiatric diseases, whereby the most frequent being anxiety disorders followed by mood disorders. Another common diagnosis is severe depression. The most frequent serious consequences are self-harm, suicide attempts and death (62). Research supports the notion that anxiety is linked to impulsive eating behaviors, such as binge eating or night eating. It suggests that certain patterns of overeating observed in EDs may serve as a means to regulate and cope with negative emotions. In other words, people take refuge in food to cope with their frustrations and negative feelings. This link further emphasizes the complex relationship that exists between anxiety, emotional well-being and disordered eating behaviors (63).
- **Dissatisfaction and Distorted Body Image:** The feeling of dissatisfaction with one's body and a distorted view of it are commonly described by ED patients. They develop an intense fear of weight gain associated with a relentless desire to be thin and achieve inappropriate thinness patterns, contributing to what is called body dysmorphia (44). This relationship may be bi-directional: body dissatisfaction may be a determinant and a consequence of EDs.
- **Social Isolation and Impaired Relationships:** The focus on food and body image becomes dominant in their lives, making it difficult for them to relate to others, participate in social events, and maintain healthy connections, thus promoting social withdrawal, isolation, and the development of broken relationships (44). The consequences of EDs extend far beyond the individual sufferer to the entire family and support network. It is common for family members to feel powerless, guilty, and frustrated when witnessing the physical

and emotional decline of a relative or friend. Relationships may become strained, communication may be affected, and the entire support system may struggle to cope with the complexities of the disease (18).

7. Potential for prevention and strategies for mitigating Eating Disorders onset

EDs are complex psychological disorders, with low rates of detection and early intervention (64). Often they are not detected and are even misdiagnosed, which consequently leads to delays in treatment initiation, promoting disease prolongation and patient suffering (64). The secrecy, shame and denial usually associated with the disease are one of the reasons why it has a low rate of detection and early intervention; the characteristics of the disease make it difficult for patients to recognize it and mitigate the need to ask for help (65). Another aspect to consider is the idea that EDs are typically associated with a certain age, gender and demographic group. This view is limiting at the time of evaluation because it can lead to biased assumptions affecting the screening process and identification of individuals at risk (66). Although a critical window for the timing of early intervention has not yet been established, it should be noted that the most effective period is in the first three years of the disease, thus relating to a higher probability of recovery (67).

Early contact with ED during adolescence is an indicator of tracking or transition to different forms of ED later in life. What the evidence shows is that once involved in these disorders, the behaviors are difficult to stop and counteract (68). One study showed that there is a 75% probability that individuals with ED during adolescence will remain with ED in adulthood or experience a transition to other EDs during a 10-year follow-up period (69).

Adolescence is a vulnerable period characterized by marked physical, social, and emotional changes. At this stage, it is common to face pressures associated with body image, social standards, academic performance, and peer relationships. In addition to all this instability, factors such as low self-esteem, exaggerated perfectionism, anxiety, depression and a history of trauma can further increase vulnerability to these disorders (40,41).

Prevention programs, according to the American Institute of Medicine, can be classified into three categories: universal, those that apply to the entire population regardless of risk; selective, those aimed at a population group with a higher than average risk; indicated, these are only for individuals who already have symptoms but have not yet been diagnosed. Most studies focus on the selective and indicated programs because these are the ones for individuals at higher risk of developing EDs (70).

Some prevention programs include cognitive dissonance-based interventions, media literacy-based programs, and multiple risk factor programs such as family-based approaches and school-based interventions. These generally aim to target at least one modifiable risk factor of EDs such as dietary restraint, idealization of thinness, body dissatisfaction, perceived pressure to appear thin (71). Others, based on personal empowerment and mindfulness, are not considered to be so specific for risk factors as they focus more on emotional regulation and empowering individuals to foster constructive behavioural changes with to food, eating, and body image (71).

Programs designed to reduce adherence to the thin ideal, that are included in cognitive dissonance interventions, were associated with a statistically and clinically significant 60% reduction in EDs onset over a 3-year follow-up compared with an assessment-only control (72). In terms of early intervention and its approaches, it seems to be more effective to use approaches to reduce the stigma associated with ED than for example a biological disease education approach that has a small to moderate impact on attitudinal stigma towards EDs (73).

Interventions promoting participant-directed improvements in dietary intake and physical activity demonstrated a 60% reduction in ED onset over a two to three years follow-up compared to an educational only assessment (74).

Given the relationship between ED and obesity, there have been studies on how obesity prevention interventions work in preventing ED, and they appear to be effective and cost-effective in preventing disordered weight control behaviors and obesity (75).

Family-based approaches involve the active participation of parents or caregivers in the treatment process, through the provision of guidance, education, and lots of support. This intervention is structured on the idea that by controlling family dynamics and communication, interventions can more easily help prevent the escalation of disordered

eating behaviors and promote healthier relationships with food. These family-based interventions have demonstrated efficacy especially with adolescent patients (64,76).

School-based prevention programs, mostly including media literacy interventions, have shown very positive effects on symptom improvement as well as behavior change and risk factor reduction (77). As well as online interventions that are very accessible, affordable, help eliminate the shame factor because the patient does not have to leave the comfort of his or her own home, meaning that there is greater engagement and thus a longer treatment time (78).

All these prevention programs aim at an early intervention in EDs onset. An early intervention allows treatment to be done in a timely manner, reducing the duration and severity of the disease. For this process to be inclusive, it is important that screening measures cover a variety of settings such as primary care, schools, and community centers. To increase effectiveness, it is also important to train staff (health professionals and educators) to improve identification of at-risk individuals and facilitate early intervention (79). In an early intervention there are some key points to fulfill: (1) directing parents and helping them to recognize the first signs during the peak of onset in adolescence; (2) working on patient motivation towards change; (3) addressing the stigma and shame associated with the pathology (64).

An Australian systematic review was developed to identify and evaluate preventive and early intervention programs for EDs. This study concludes that although these programs have been shown to significantly reduce risk factors, promote symptom recognition, and promote help-seeking behavior, most of them have been conducted in older adolescents and college students outside the peak ages for EDs. Body dissatisfaction is one of the most researched risk factor, but it is found in children as young as six years old, which justifies the need for more research on prevention at younger ages (64). Another systematic review and meta-analysis concluded that although the effect of the prevention programs was small, it was significant in reducing the onset of EDs, and that programs that addressed multiple risk factors and had interactive and participatory strategies had the best results (79).

The main challenges associated with these studies in the prevention and intervention field have been associated with limited resources, lack of standardized protocols, and the need for more research to evaluate the long-term effectiveness of

prevention strategies. There is also debate about the importance of multidisciplinary teams and collaboration between them promoting knowledge exchange and continuous evaluation to enhance the development and implementation of evidence-based interventions (79).

This review underscores the need for an early intervention and prevention efforts to address EDs early in life and improve long-term consequences. There is a pressing necessity to educate health professionals, educators and the general public about the nature of EDs and the importance of considering all individuals, regardless of age, gender or background, as potentially at risk. When we increase knowledge and begin to challenge biased assumptions we can establish a more inclusive and effective treatment process ensuring that individuals from all backgrounds receive the support and care they need (40,79).

8. Discussion and Conclusions

Adolescence is a critical period when changes occur, playing a key role in the development of EDs. During this phase, young people face pressures related to body image, social acceptance, and cultural norms of beauty, which can lead to a distorted relationship with food and an excessive preoccupation with weight and body shape. The impact of these disorders extends beyond the adolescent years, as there is evidence indicating that early involvement with EDs can lead to long-term persistence or transitions to different types of EDs in adulthood.

Anorexia nervosa, bulimia nervosa, and binge eating disorder are the most common disorders in adolescents. Genetic, environmental, and psychological factors contribute to the emergence of eating disorders in adolescents. These disorders have serious consequences for the physical and mental health of affected individuals, negatively impacting their food choices, quality of life and overall well-being.

Regarding specifically food choices, the evidence highlights the significant differences in caloric intake, macronutrient composition, and eating behaviors between individuals with different types of EDs. Recognizing these variations and incorporating them into comprehensive treatment plans may contribute to more targeted interventions and better outcomes for those facing eating disorders.

It should be noted that EDs also have an impact on individuals' dietary preferences, even throughout the process of recuperation. These conditions can bring about substantial alterations in an individual's connection with food, resulting in limited, impulsive, or irregular behaviours. Even after achieving recovery, certain individuals may encounter challenges in making nutritious and well-rounded food selections due to habits formed during the illness. These modifications in the connection with food may endure for a period of time following therapy, as the mental and emotional consequences of EDs can endure.

Crucially, early detection and appropriate treatment play a key role in recovery and prevention of serious complications related to eating disorders. The earlier these disorders are identified and treated, the greater the chances of a full recovery and of preventing progression to more severe stages of the disease. In addition, ongoing support and relapse prevention are essential aspects of long-term patient care.

A multidisciplinary and integrated approach is key to the effective prevention and treatment of EDs in adolescents. This involves collaboration between health professionals, such as physicians, psychologists and nutritionists, as well as family members and educators. Working together to identify risk factors, provide emotional support, educate about healthy eating, and promote positive body image are important strategies for preventing and treating these disorders.

However, there are still some obstacles to overcome such as limited resources, lack of defined standards, and the need for long-term evaluation of preventive efforts. More research is needed to address these issues and create evidence-based solutions using a multidisciplinary approach. It is important to join efforts to by providing support and care to individuals from all backgrounds, raising awareness, challenging preconceived assumptions, and promoting inclusive treatment processes, ensuring early intervention and better long-term outcomes in the prevention and management of EDs in adolescence and beyond. By taking these approaches, we can significantly improve the quality of life for these young people by providing them with the emotional, physical, and psychological support needed to overcome the challenges inherent in the disease and aim to promote a healthy relationship with food and body throughout their lives.

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