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REVIEW ARTICLE

Avoidant/Restrictive Food Intake Disorder (ARFID): What the pediatrician should know

Trastorno de Evitación y Restricción de la Ingesta de Alimentos (ARFID): Lo que el pediatra debe saber

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What do we know about the subject matter of this study?

Avoidant/Restrictive Food Intake Disorders (ARFID) was introduced to the DSM-5 in 2013, in the Eating Disorders section to describe avoidant/restrictive eating behaviors in the absence of shape or weight concerns.

What does this study contribute to what is already known?

Due to the recent incorporation of ARFID to the DSM-5 there are no empirically validated treatments. The objective of this review is to present diagnostic criteria, clinical subtypes (food selectivity, poor appetite/food intake, and post-traumatic food aversion) and treatment including progressive approach to feeding difficulties.

Abstract

Feeding problems during childhood have been described over time by various authors. In 2013, Avoidant/Restrictive Food Intake Disorder (ARFID) was included in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), as a new diagnosis within the Feeding and Eating disorders, to describe a group of patients with avoidant or restrictive eating behaviors unrelated to body image disorder or weight loss desire. ARFID may appear as significant weight loss and/or nutritional deficiency and/or a marked interference in psychosocial functioning. There are three forms of presentation, which can co-occur or occur independently. The first one includes children with sensory aversions (selective), who reject certain foods due to their taste, texture, smell, or shape; the second one includes those children with poor appetite or limited intake (limited intake); and the third one includes those children who reject certain foods or stop eating as a result of a traumatic event (aversi-

Keywords:
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ve). Due to the recent incorporation of ARFID into the DSM-5, there is a lack of information regarding its treatment. The purpose of this review is to clarify diagnostic criteria and to describe targeted management and treatment interventions with a multidisciplinary approach, without deepening on the treatment of organic medical causes.

Introduction

The spectrum of feeding difficulties in pediatrics ranges from normal feeding behavior, which is perceived as a problem from the parents' point of view to a refusal or avoidance of feeding without apparent cause that can lead to eating disorders of organic origin[1,2].

Feeding is a complex process that requires a coordinated interaction between the nervous, cardiopulmonary, gastrointestinal, and oropharyngeal systems. This coordination also requires acquired skills appropriate to the child's stage of development and occurs within the context of the caregiver-child pair, so feeding disorders can be the manifestation of an alteration in any of the systems before mentioned[3]. This process can have consequences both on the child, in her/his physical, social, emotional, and/or cognitive function, and on the caregiver, increasing stress and predisposing to mental health disorders[4].

Diagnostic criteria have varied according to the different publications due to the lack of a universally accepted definition. However, in 2013, the diagnosis of Avoidant/Restrictive Food Intake Disorders (ARFID) was established in the DSM-5[5]. Table 1 shows the diagnosis criteria. The ARFID criteria focus on eating behaviors, specifically food selectivity, poor appetite, and posttraumatic food aversion, while simultaneously decrease the role of medical or psychological comorbidities in eating problems[6]. Bryant-Waught et al[3] and Kreipe and Palomaki[7] explain in their reviews the new DSM-5 definition, and as Milano et al[6], recognize these three clinical entities (poor appetite, food selectivity, and posttraumatic food aversion), which can occur at any time in the life cycle, even in adulthood.

Epidemiology

Given its recent incorporation into the DSM-5, there are still few epidemiological reports currently available. Its prevalence varies according to the care center profile where the study is performed, from 3.2% in the school population aged 8-13 years[8] to 14-23% in outpatient treatment centers for eating disorders[9]. This increases even more (80%) in children with autism spectrum disorder (ASD)[10], multiple food allergies (MFA)[11], and premature patients[12].

Etiology

The etiology remains unknown and is under study. A multifactorial origin is proposed, including biological, psychological, and environmental factors that merge and trigger the onset of the disease[13,14]. Among the biological factors involved, hormonal and appetite-regulating peptides alterations are proposed; as well as alterations in taste sensitivity and perception or lack of exposure to some flavors[15,16].

Early exposure to stress factors, including intrauterine conditions, prematurity, bonding alterations, and traumatic events during development, are associated with psychopathologies whose manifestations include feeding disorders[17]. On the other hand, normal motor development is essential for sucking, swallowing, and learning to feed oneself, as well as progressing from liquid feeding to a semi-solid and solid diet according to the acquisition of motor skills[18].

Environmental factors can affect the child's ability to learn "where, how, and how much it is appropriate to eat" due to the absence of appropriate modeling (related to the type of food and the eating environment.), force feeding, or lack of exposure to new foods. The type of parenting style[19] also plays a role: authoritative (responsive), authoritarian (controlling), permissive (indulgent), and neglectful. The ideal practice is the authoritative (responsive)[20] style, which allows both acceptance and rejection of new foods, establishing appropriate limits[21,22] as opposed to the authoritarian and negligent styles that are most associated with ARFID.

The result of negative responses associated with aversive experiences such as repeated vomiting, choking episodes during feeding or medical procedures[23], and the presence of parental psychopathology, mainly eating or mood disorders, have also been described as a risk factor in the development of feeding disorders in their children. Finally, the occurrence of ARFID has been associated with a range of pathologies such as ASD, prematurity, and multiple food allergies[10-12].

Clinical manifestations and diagnosis

There are multiple associated symptoms, which can be grouped into three forms of clinical presentation[6, 13] to facilitate their management (table 2) as follow: (i) limited-variety (food selectivity) ARFID, those patients who selectively refuse some foods because of

their sensory characteristics, such as taste, textures, smell and/or shape; (ii) poor food intake/appetite (lack of interest) ARFID, those who present with poor appetite awareness and little interest in food; and iii) food aversion (post-traumatic) ARFID, those who abruptly stop accepting all or a group of foods due to fear of having adverse consequences when eating them, such as choking or vomiting, usually after having lived one of these experiences. It can also be observed after a traumatic event not directly related to food, such as the death of a family member, initiation of medication, hospitalization, or medical procedure.

These patients generally have an anxious temperament and hypersensitivity to bodily sensations. As a result, when faced with a traumatic eating experience, their initial fear increases rapidly from acute and normative to chronic and intense[24]. This fear leads them to overestimate the probability that this event will be repeated over time with the same or different foods, therefore they begin to limit their intake of the food that caused the trauma, and then extend it to other similar foods. In severe cases, they come to limit all solid intake and consume only liquid or soft foods. To avoid these foods, they also do not expose themselves to situations where they can taste them, thus eliminating negative predictions about the danger and safety of food[25].

The first two groups generally begin during the first years of life, appearing as a chronic form, of which selectivity becomes evident with the introduction of more solid foods. The aversive or post-traumatic presentation can occur throughout the life cycle and occur in combination or independently.

The literature describes that ARFID presents greater psychiatric comorbidity, including mood disorders, anxiety disorders, obsessive disorders, post-traumatic stress disorders, and neurodevelopmental disorders, among which ASD and attention deficit hyperactivity disorder stand out[26]. In addition to its diagnostic criteria and subtypes, other associated symptoms that should be considered in the suspicion of ARFID are dysphagia, abdominal pain, reflux, nausea, anxiety, and prolonged meal/feeding time[24].

Associated pathologies

ARFID and Autism Spectrum Disorder (ASD)

Food selectivity (type, texture, and/or type of presentation) is the most frequent eating disorder associated with ASD patients, and it may be the first symptom in children with neurodevelopmental disorders who have not yet been diagnosed. In addition to selectivity, these patients present food rejection, disruptive patterns of eating behaviors, and may have preferences for unhealthy foods or inadequate portions, such as carbohydrates, sweets, crunchy textures, and/or processed foods; rejecting simultaneously fruits (27%) and vegetables (67%)[27]. Its prevalence has not yet been clarified, however, previous studies estimate that between 46-89% of children with ASD present atypical eating habits.

In a meta-analysis[10], Sharp et al indicate that around 95% of these patients present some feeding difficulty compared to their peers with normal development. The possible etiology may be due to abnormal sensory processing as well as insistence on routines. Pathologies such as prematurity, gastroesophageal reflux, or food allergy may coexist with this condition, which could intensify the difficulties but are not the actual cause[27]. The clinical manifestations include a strong emotional response, especially when new food is introduced or food that is not to their liking is offered, such

Table 1. Definition of Avoidant/Restrictive Food Intake Disorder (DSM-5)[5]

Avoidant/Restrictive Food Intake Disorder (ARFID)
Persistent failure to meet appropriate nutritional and/or energy needs associated with one (or more) of the following (at least 1):
Significant weight loss (or failure to achieve expected weight gain or faltering growth in children)
Significant nutritional deficiency
Dependence on enteral feeding or oral nutritional supplements
ARFID does not include
The disturbance is not better explained by lack of available food or by an associated culturally sanctioned practice
It does not occur exclusively during the course of anorexia nervosa or bulimia nervosa (there is no distortion of body image).
Is not attributable to a concurrent medical condition or not better explained by another mental disorder
If it occurs in the setting of another condition or disorder and the severity exceeds that commonly associated with that condition, further clinical care is warranted.
It does not refer to normal developmental behaviors (for example, selective eating in young children or reduced intake in adults)

Table 2. Clinical manifestations according to subtype of Avoidant/Restrictive Food Intake Disorder

Food Selectivity	Poor Appetite/Food Intake	Post-traumatic Food Aversion
Difficulty with the texture, sensations, taste, smell, or shape of food	Small portion sizes	Fear of different events; vomiting, choking, contaminated food
Aversion to liquids	Poor appetite	History of a traumatic event
History of being "picky eating"	No interest in food	
Specific food restriction	Early satiety	

as pushing food away, turning their head away, getting up from the table, shouting, throwing food, and aggressive behavior.

ARFID and multiple food allergies

Strict elimination of potential allergens has been the main treatment of MFAs, which could contribute to the appearance of ARFID since it does not allow the natural interaction of the child in early stages with food, family, and environment[28]. The prevalence varies from 40%[29] to 94%[11]. Its etiopathogenesis has not been clarified, and the influence of the late introduction of lumpy foods (after 9 months)[30] and restricted food variety is postulated. In eosinophilic gastrointestinal disorders, there is also a prevalence of painful symptoms associated with feeding or anxiety/fear leading to avoidance (post-traumatic food aversion ARFID)[31].

ARFID and Prematurity

Preterm children often experience problems with oral feeding, making them more vulnerable to inadequate nutrition, development, and growth. They present difficulty with suck-swallow-breathe coordination which can lead to delayed development of feeding skills, food refusal, and difficulty transitioning textures. Its etiopathogenesis is not clear but is attributed to immaturity and frequent exposure to noxious sensory stimuli (intubation, aspiration, enteral tube)[12]. Its prevalence ranges from 25 to 80%[12] and it is noted that the greater the prematurity and the association of comorbidities, the greater the impact[32,33]. The clinical manifestations described are oral-motor disorder, aspiration, asphyxia, and the different subtypes of ARFID[12,32].

Complications

Complications associated with ARFID may affect nutritional status as micronutrient intake. Patients may be normal weight, underweight or overweight, whether or not associated with micronutrient deficiencies (minerals, vitamins, or trace elements). In patients with long-standing food refusal, the decreased intake leads to chronic malnutrition that triggers compensatory physiological mechanisms when facing prolonged fastings, such as decreased basal metabolism and hormonal modifications that produce cardiovascular, renal, gastrointestinal, hematologic, and bone alterations. On the other hand, children with limited-variety ARFID may present deficiency signs depending on the type of micronutrient deficit. In children with ASD, the nutritional status stands out for its higher prevalence of malnutrition by excess than in the normal population, and the ranges vary depending on the study, reaching 63% compared with 38% in the control group[34].

The diagnosis of nutritional deficiencies remains poorly described and is based on dietary intake history, signs and symptoms, and laboratory tests. Most studies describe weight loss but also reported deficiencies that may include several minerals, vitamins such as A, C, E, K, D, B_{12}, and folates, and different consequences may occur depending on the severity of the restriction (table 3)[35-38].

Any of the clinical presentations can appear followed by stress for both the patient and their family, whether due to the management of ARFID (hospital visits, feeding tube replacement, feeding therapies, among others), stress generated during meals which can lead them to avoid eating at school, work, social meals, etc., and problems related to parent-child interaction[39].

Treatment and follow-up

Psychological treatment and follow-up, with emphasis on cognitive behavioral therapy in children and adolescents, and bonding therapy in infants or preschoolers, is still the mainstay for pediatric patients requiring a multidisciplinary approach, and so far, few studies have monitored the results of treatment[40].

The medical nutritional evaluation should include three steps: (i) detailed dietary history and intake record, (ii) growth curve, and (iii) search for acute or long-term medical complications secondary to underweight, obesity, or vitamin and/or mineral deficiency. Organic diseases such as celiac disease, MFA,

Crohn's disease, and functional eating disorders that may contribute to the development or maintenance of ARFID[1] should be ruled out.

The intake record will determine caloric intake and food variety. The feeding history should include feeding difficulties during breastfeeding or when introducing more solid foods[30] as well as place, time, and position at feeding, and the presence of anticipatory gagging and vomiting. Psychosocial functioning should also be assessed, considering the child's neurodevelopmental history and milestones[18], temperament, attachment styles, relationship with caregivers, sensory alterations, difficulties experienced or presented throughout life, somatic symptoms, psychiatric comorbidity of both the patient and caregivers[24], among others, as well as assessing the impact of the presence of ARFID on the nuclear family[4].

The growth curve will report the trajectory of weight, length/height, and head circumference, and we can also observe the break or change of lane of these parameters and thus observe the relationship between the onset of symptoms or suggest possible organic etiologies depending on age. The search for medical complications through complementary laboratory tests will depend on the information provided by the anamnesis and physical examination[35].

Treatment goals should be adapted according to the patient's needs, such as reducing nutritional, physical, and emotional risks, while helping the patient to manage food anxiety, if present, and to broaden her/his food range. There is still no consensus in the literature on the optimal treatment, but it should be carried out by a multidisciplinary team made up of a nutritionist, dietician, mental health professional, occupational therapist, and speech therapist, with the close collaboration of parents and/or caregivers[40]. The intensity and number of professionals will depend on the type and severity of ARFID. Most treatments include psychoeducation of parents, teaching the child to regulate, analyzing, and planning changes in routines and habits to work with the child to introduce the food.

Table 3. Nutritional Complications Avoidant/Restrictive Food Intake Disorder

Chronic complications	Nutritional deficit
Rickets or bone metabolism alteration	Calcium and Vitamin D
Edema	Protein
Hyperhomocysteinemia	Vitamin B12 and Folic acid
Microcytic anemia	Iron and Vitamin C
Scurvy	Vitamin C
Oxidative stress	Zinc, Selenium

According to Milano et al[6], one of the strategies for dealing with this pathology is a progressive approach that goes from normal eating behavior perceived as a problem to significant disorders. It is suggested to start with: (i) identification of red flags that put the child in a serious threat according to the different areas (medical, nutritional, developmental, and psychosocial); (ii) detection of any motor or oral dysfunction, which should be managed immediately by a multidisciplinary team; (iii) stabilize the nutrient intake with adequate caloric-protein intake, while the different interventions are carried out without detriment to the nutritional status; and finally (iv) the elimination of aversive feeding practices (table 4).

After these stages of progressive management, we can initiate more specific interventions, which can be grouped in the three before-mentioned predominant feeding behaviors[13] (figure 1). In children with poor appetite/food intake ARFID, the intervention should focus on improving hunger/satiety cycles while providing adequate nutrition. This requires a higher caloric intake without abrupt changes in volumes, schedules, gradual enlargement of portions, and, in parallel, cognitive-behavioral management based on rewards that should be gradually eliminated, and participation in meal preparation, evaluating the presence of psychiatric comorbidities that can be intervened. Growth failure and micronutrient deficiencies are generally associated with the most severe cases.

Children with food selectivity ARFID follow a systematic desensitization and a structured nutritional plan with therapy based on gradual exposure, relaxation techniques, and play. To avoid weight loss, nutritional intake should be provided through sufficient quantities of preferred foods and/or liquid supplements, reserving tube feeding for very extreme cases.

Problem foods are progressively incorporated. It is necessary to educate parents, advising them to expose children to new foods firmly and repeatedly. Foods should be offered 8-15 times without pressure to achieve acceptance. Other techniques may be necessary, such as "hiding" vegetables in sauces, using "additives" to enhance flavor, shaping food, giving foods attractive names, involving children in preparation, presenting foods in attractive designs, and the "food chaining" technique, which consists of the gradual replacement of foods that are accepted by others with similar characteristics or shapes, in which the volumes offered are progressively exchanged[41]. Other behavioral techniques include distraction to avoid nausea and techniques to prevent the food from being retained in the cheeks such as going around the child's mouth with the spoon or physically guiding the child to accept the food.

The presence of sensory alterations that may in-

fluence food refusal should be evaluated, which can be treated by occupational or speech therapists with experience in the subject, as well as performing an exhaustive search for psychiatric comorbidity, mainly neurodevelopmental disorders. Most of these patients do not present growth impairment, but as they are highly selective, especially of foods such as meats, fruits, and vegetables, in some cases they may require micronutrient supplements containing vitamins, calcium, iron, and zinc[35].

In the case of children with ASD, behavioral intervention is used which represents a proven treatment for feeding disorders in pediatric patients since an improvement in the widening of nutritional variety has been observed. However, these strategies have been carried out in hospitals, in few geographical locations, and at a high cost, so clinical trials are currently proposing group therapies for parents, due to the central role they play daily in behavioral modifications and a more familiar environment[42,43].

In post-traumatic food aversion ARFID, we should look for a trigger of the change in eating behavior, as well as the presence of anxious and phobic symptoms throughout life[26]. In these cases, the literature suggests management by mental health specialists, treatment with cognitive-behavioral psychotherapy, and evaluation of the use of psychotropic drugs, if appropriate[44,45]. There are few publications of cases of treatment with selective serotonin reuptake inhibitors (SSRIs) and/or antipsychotics which use should be reserved for case-by-case use by specialists who evaluate risk versus benefit. Some techniques that could be used are changing the feeding environment, using different utensils, play therapy such as sequentially increasing contact with food, followed by praise and rewards.

In the most severe cases of ARFID, some patients may require hospitalization[40] to complete evaluation and reinitiate feeding, using a nasogastric tube (NGT). The use of NGT should be considered if the child is unable to meet her/his requirements through oral feeding or in the context of medical instability such as severe malnutrition or micronutrient deficiency that may lead to increased morbidity and mortality. However, to date, there is little evidence of its recommendation in ARFID, and clinical guidelines are mainly based on experiences, consensus, and extrapolated information from patients with anorexia nervosa. Katzman et al[46] recommend that when deciding on its installation, its possible negative consequences in a stable patient should be considered, such as contributing to food aversion when there are clinical symptoms suggestive of hypersensitivity and nausea. In addition, the installation of NGT should not be associated with the halt of efforts to achieve oral rehabilitation and should be removed when achieving nutritional objectives[47]. Gastrostomy is only reserved for severe cases that do not respond to multidisciplinary treatment.

Drugs/Medication

The use of appetite stimulants, such as cyproheptadine, could be useful in children with poor appetite/food intake ARFID, but their mechanism of action is not well known. In a review by Harrison et al[48], they include ten articles of underweight children, who improve in some degree their weight, but none of them presented a change in appetite. Supplements of vitamin

Table 4. A stepwise approach to Avoidant/Restrictive Food Intake Disorder

Step 1 Red flags	Step 2 Signs of impaired oral development	Step 3 Stabilize nutrient intake	Step 4 Guidelines to prevent aversive feeding practices
Chronic cardio-respiratory symptoms	Difficulty managing food or liquid in mouth	Adequate caloric intake for nutritional recovery	Limit meal duration (20-30 minutes)
Nutritional deficiencies	Difficulty with feeding milestones	Multi-nutrient supplement for limited dietary variety	Tolerate age-appropriate mess
Vomiting and diarrhea	Altered muscle tone	Specific nutrient supplementation for documented deficiency	Avoid juice and give only water for thirst
Developmental delay	Gagging or choking		Maintain a neutral attitude
Dysphagia	Failure to advance textures		Meals every 3-4 hours
Aspiration	Excessive drooling		Serve age-appropriate foods
Growth failure	Poor postural control		Offer new foods (8-15 times)
			Avoid mealtime distractions
			Encourage self-feeding

*Table adapted from Milano et al.[6]

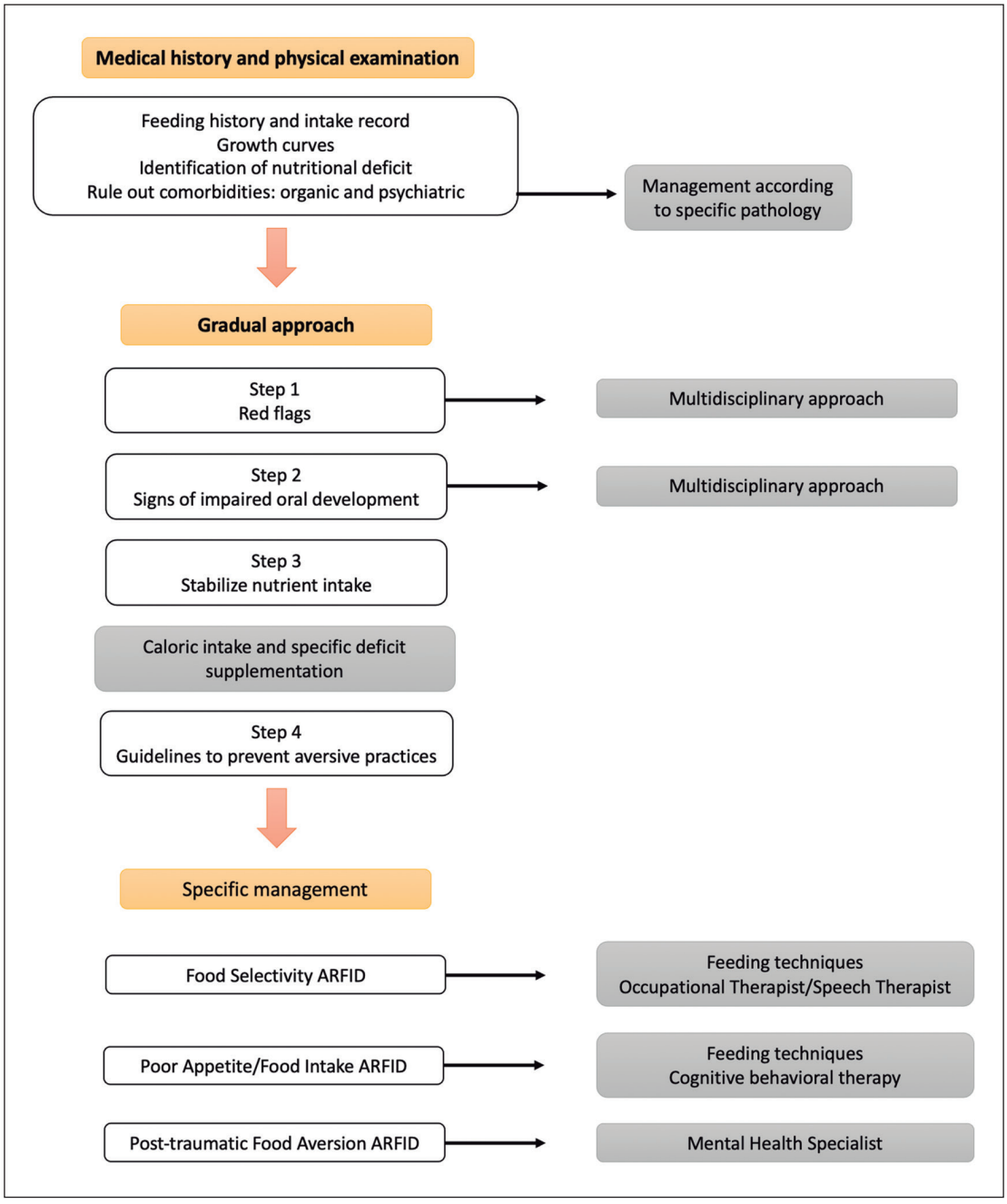

Figure 1. Flow diagram of approach and management of Avoidant/Restrictive Food Intake Disorder (ARFID)

B_{12}, iron, zinc, calcium, vitamin D, or multivitamins are recommended in cases of low intake or deficiency, especially in the period of nutritional recovery due to increased requirements.

Regarding the psychiatric management of patients with ARFID, there is no evidence-based indication for pharmacological treatment. Spettigue et al. describe six cases of ARFID and anxiety comorbidity that present a good response to the use of pharmacotherapy and family therapy. All of them were treated with an antipsychotic along with an SSRI[49,50]. Concerning patients with post-traumatic food aversion ARFID, the use of SSRIs has been described as useful[44,45] where there has been a choking event followed by a refusal to feed and/or ingest fluids.

Conclusion

Feeding disorders in pediatric age have been described historically and range from caregiver misperception to organic pathology. The diagnosis of ARFID

arises from the need to establish a clinical entity, which was previously classified as other eating disorders or nonspecific ones. The progressive approach eases the management and treatment, allowing us to detect the different stages of severity. Both mild and moderate disorders can be tackled with different feeding techniques and parenting styles, leaving the most severe cases for multidisciplinary teams. Currently, there is little evidence on therapeutic strategies, therefore, it is essential to report clinical experience in order to generate more knowledge.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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