

Adverse Food Reaction and Functional Gastrointestinal Disorders: Role of the Dietetic Approach

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ABSTRACT

Bloating, abdominal discomfort or pain, disturbed bowel habits are very common symptoms, frequently reported by the patients soon after food ingestion. These symptoms may occur in different clinical conditions, such as functional bowel disorders, food adverse reactions, gluten-related syndromes, which frequently are interrelated. Consequently, in clinical practice, it is necessary to perform a correct diagnosis in order to identify, for the single patient, the most appropriate therapeutic strategy, which may include not only specific drugs, but also, and mainly, life style changes (healthy nutritional behavior and constant physical activity). The aim of this review is to provide to the general physician, according to the available evidence, the most appropriate diagnostic work-ups for recognizing the different clinical scenarios (i.e. food allergy and intolerance, functional bowel diseases, gluten-related syndromes), to identify their clinical interrelationships and to suggest the most appropriate management. In fact, as far as food intolerances are concerned, it is well known that the number of patients who believe that their symptoms are related to food intolerance is increasing and consequently they restrict their diet, possibly causing nutritional deficiencies. Furthermore, there is an increasing use of unconventional diagnostic tests for food intolerance which lack accurate scientific evidence; the application of their results may induce misdiagnosis and unhealthy therapeutic choices. Consequently the recognition of food intolerance has to be performed on the basis of reliable tests within an agreed diagnostic workup.

Key words: food intolerance – food allergy – functional gastrointestinal disease – FODMAPs – gluten sensitivity.

Abbreviations: ACD: allergic contact dermatitis; AGA: antibody against gliadin; ATIs: amylase trypsin inhibitors; CD: Celiac disease; FODMAPs: Fermentable Oligo-Di-Monosaccharides And Polyols; GOS: galactooligosaccharides; IBS: irritable bowel syndrome; LM: lactose malabsorption; NCGS: non-celiac gluten sensitivity; RAST: radioallergosorbent test; SNAS: systemic nickel allergy syndrome; WA: wheat allergy.

INTRODUCTION

More and more people are referred for swelling, abdominal tension, discomfort, bloating, belching, altered bowel habit and diarrhea; these symptoms can signal not only the existence of malabsorption syndrome, food allergies and food intolerance but also functional gastrointestinal diseases, mainly irritable bowel syndrome (IBS). Consequently the differential diagnosis between these conditions may become very difficult [1].

It is evident that an overlapping management of the symptoms attributed to functional diseases and food allergies/intolerances can coexist, since it is not possible to exclude conditions under which both pathologies coexist [1]. Functional gastrointestinal disturbances are characterized by the presence of chronic and recurring symptoms which, even though originating in the gastrointestinal tract, cannot always be attributed to identifiable (structural or biochemical) causes and are frequently triggered and/or exacerbated by the consumption of food [2]. The response of the intestinal tract to food ingestion is a complex mechanism controlled by processes which permit the propulsion, digestion, absorption of nutrients and removal of indigestible compounds [3, 4]. The appearance of both abdominal and systemic symptoms can also be attributed to food consumption. The role of food in the pathogenesis of functional gastrointestinal diseases is,

however, poorly understood; therefore, exactly how much this is associated with the emergence of symptoms or their exacerbation should be evaluated [5–7]. Cases of intolerance and food allergies, or symptoms which refer to the existence of these possible diseases, are increasing [8].

From the point of view of the overall management of the patient, it is therefore essential to identify the existence of one or the other of the two conditions, or the case of their coexistence. It is essential to define the individual diseases, the patterns of association and their relationship with food in order to construct a diagnostic/therapeutic algorithm which allows the optimal management of the patient.

The aim of this review is therefore to propose a diagnostic algorithm for patients suffering from abdominal symptoms, principally characterized by a possible exacerbation in relation to food ingestion.

A literature search was performed using Pubmed, Embase and Scopus. Search terms included “adverse food reaction”, “food allergy”, “food intolerance”, “IgE-mediated”; “non IgE-mediated”, “nickel allergy”, “gluten sensitivity”, “functional gastrointestinal disorder”, “irritable bowel syndrome” related to nutrition, diet and dietary habits taking into consideration only human studies from relevant papers.

ADVERSE REACTIONS TO FOOD

An adverse reaction to food can have an immunological basis (food allergy) or a non-immunological basis (food intolerance) with different clinical pictures [9, 10].

Food allergy

Food allergy is an adverse immune response towards food proteins or a form of food intolerance associated with a hypersensitive immune response. There are three types of food allergies: IgE mediated (immediate type, type I hypersensitivity), mixed IgE/non-IgE (involves eosinophilic and other cellular components, and often shows clinical features of the overlapping of the two mechanisms: IgE mediated and non-IgE mediated) and non-IgE mediated (delayed type, cellular, type IV hypersensitivity) [11, 12].

Of the 20–30% of the population reporting to be allergic or to have allergic children, the presence of allergy can be ascertained in only 6–8% of children under 5 years of age and in 3–4% of adults [11].

However, it is believed that the prevalence of food allergies in infancy is increasing, now being reported to exist in up to 15–20% of children [11, 13]. The most common food allergies are reported in Table I.

In the presence of food allergies, even a small quantity of food can cause an immediate reaction. The signs and symptoms involving the gastrointestinal tract can include nausea, vomiting, abdominal cramps, diarrhea; other signs and symptoms can involve the oropharyngeal tract or the skin (the latter will not be discussed in this article and, therefore, the reader is referred to specific articles on the subject) [14].

There has been interest regarding the possible role of food allergies in irritable bowel syndrome (IBS) for a long time but data supporting this association are limited. Nevertheless, with the elevated prevalence of food allergies, it is likely that

Table I. Most common food allergies in Europe [100]

Food allergy	Self-reported prevalence (%; C.I.)	Food-challenge-defined prevalence (%; C.I.)
Cow's milk	6.0 (5.7-6.4)	0.6 (0.5-0.8)
Egg	2.5 (2.3-2.7)	0.2 (0.2-0.3)
Wheat	3.6 (3.0-4.2)	0.1 (0.01-0.2)
Soy	-	0.3 (0.1-0.4)
Peanut	0.4 (0.3-0.6)	0.2 (0.2-0.3)
Tree nuts	1.3 (1.2-1.5)	0.5 (0.08-0.8)
Fish	2.2 (1.8-2.5)	0.1 (0.02-0.2)
Shellfish	1.3 (0.9-1.7)	0.1 (0.06-0.3)

C.I.: confidence interval

patients with functional disturbances can have both allergies and hypersensitivity [9].

In addition to food allergies, gastrointestinal symptoms can also be caused by allergies to metals, the most common being nickel.

Allergy to nickel

Nickel is the most common allergen detected in patch-tested patients. Atopy patch tests detect delayed hypersensitivity reactions and can also show immediate urticarial reactions. Patch testing is performed by applying food extract directly to the skin of the patient's back and then assessing for erythema, infiltration and papules after 48–72h [12, 15].

Nickel allergy is highest among females and patients under the age of 18, affecting 35.8% of patients patch-tested in this group [16]. Nickel allergic contact dermatitis is a T-cell-mediated immune reaction which most commonly presents as a skin rash in areas exposed to nickel [16]. The prevalence of nickel hypersensitivity varies widely in different countries [17]. Estimates of the prevalence of nickel sensitivity in the general population range from 4 to 19% [18, 19].

Nickel is found in many commercial products, including zippers, buttons, jewelry, watches, eyeglass frames and mobile phones, and many of these items have been linked to contact dermatitis reactions [18]. The presence of nickel in the diet (mainly plant foods) in some nickel-sensitive subjects can cause eczema and systemic contact dermatitis as well as extra-cutaneous symptoms (respiratory, gastrointestinal, neurological) [17]. The most common clinical manifestation of metal hypersensitivity caused by nickel is allergic contact dermatitis (ACD) [20].

Food intolerance

Food intolerance is an adverse reaction to food which does not involve the immune system [12]. It often causes abdominal cramps or diarrhea due to the preparations containing foods capable of triggering the reaction. An example of triggers are milk and dairy products when an intolerance to lactose or to fermentable oligo-di-monosaccharides and polyols (FODMAPs) is present and grains containing gluten in the case of gluten sensitivity or celiac disease (CD) [9, 21].

Non-allergic food intolerance can include pharmacologic, metabolic and gastrointestinal responses to foods or food compounds provoked by the pharmacological agents present in foods, such as histamines, sulfates and glutamate [22, 23].

It may be difficult to determine the smallest amount of tolerated substance because reactions can be delayed or dose-dependent, and a particular reaction-causing compound may be found in many foods.

The symptoms correlated to food intolerance, and not involving the immune system, are generally of lower intensity and have a less strict temporal relationship with respect to those present in allergic syndromes. In fact, in the case of food intolerance, excluding CD for which a specific treatment is required, it is possible that the assumption of a small amount of the food causing intolerance is not followed by the appearance of significant symptoms [14].

The intolerances and hypersensitivities most frequently found are: a) pathologies associated with gluten sensitivity and wheat allergy; b) lactose intolerance and c) hypersensitivity to FODMAPs.

Gluten-related diseases or conditions

Under this heading pathological conditions which have gluten intake as the main pathogenetic mechanism are listed. The most relevant clinical condition is represented by CD. In the majority of cases, the clinical picture requires carrying out serological, endoscopic and histopathological tests useful for the diagnosis [24].

A detailed description of the physiopathological mechanisms at the basis of CD falls outside the aim of this report; therefore, the reader is referred to specific articles on this topic [24–27].

However, the necessity of its exclusion in patients with even slight gastrointestinal symptomatology is confirmed [24].

Gluten sensitivity

There is great interest regarding the role of gluten in the production of symptoms which are very similar to those of patients with CD without, however, the presence of serologic, endoscopic and histopathological data indicative of CD. Research suggests a heterogeneous condition with some characteristics of CD but often classified as a functional disorder [6, 7].

There is consensus in defining sensitivity to gluten as a non-celiac gluten sensitivity (NCGS), in order to demonstrate how the diagnosis must be reached by means of the exclusion of other pathologies associated with gluten, such as CD or wheat allergy (WA) [28].

Today, it can be confirmed that NCGS represents a clinical reality which can be defined, as suggested by Verdu et al. [29] as one or more of a variety of immunological, morphological or symptomatic manifestations which may also be shared by CD and IBS [29]. Others prefer to state that NCGS is a form of gluten intolerance when both auto-immune CD and WA have been excluded [30]. However, the most recent definition [31] says that NCGS is a condition in which symptoms are triggered by gluten ingestion, in the absence of celiac-specific antibodies and classical celiac villous atrophy, with variable human leukocyte antigen (HLA) status and the variable presence of first generation anti-gliadin antibodies [24].

Non-celiac gluten sensitivity is an emerging clinical problem characterized by various manifestations and, in particular, by symptoms similar to IBS which, therefore,

necessitate having more restrictive diagnostic criteria [32]. Its prevalence has been estimated to be from 6 to 10 times higher compared to CD [33].

Lactose intolerance

Lactose malabsorption (LM) is characterized by the incomplete hydrolysis of lactose due to a deficit of lactase which can manifest itself as a disturbance which can be primary or secondary to other intestinal diseases [34]. Individual overestimation and variability between individuals due to the presence of different thresholds of intolerance and self-diagnosis is often present [35].

Primary lactose intolerance is most commonly due to declining levels of intestinal lactase activity in later childhood and adulthood. The symptoms are dose dependent and include abdominal discomfort, bloating, wind and diarrhea following ingestion of lactose-containing foods [36]. Secondary lactase deficiency can also be observed in viral gastroenteritis, Crohn's disease and CD, etc [37].

Fermentable oligo-di-monosaccharides and polyols

Fermentable oligo-di-monosaccharides and polyols are poorly absorbed short chain carbohydrates which, due to their small molecular dimensions and rapid fermentability, cause a distension of the intestinal lumen with the accumulation of liquids and the production of gas [38]. Food intolerance has long been thought to play a role in the genesis of symptoms of IBS and carbohydrates have been the major target of dietary modification for functional gut symptoms [39]. Abdominal symptoms have specifically been induced following challenges with sugar (lactose or fructose), sorbitol and oligosaccharides (fructans) alone or in combination. When poorly absorbed short chain carbohydrates exert osmotic effects in the intestinal lumen, increasing its water volume, they are rapidly fermented by bacteria with consequent gas production and the induction of gastrointestinal symptoms after their ingestion [39].

In the presence of these symptoms, the following foods which are high in FODMAPs must be excluded from the diet: fruits containing fructose in excess of glucose (apples, pears, watermelon, etc), vegetables containing fructans (onions, leeks, asparagus, artichokes, etc.), wheat products, foods containing sorbitol and foods containing raffinose (legumes, lentils, cabbage, Brussel sprouts, etc).

In addition, lactose-containing foods should be excluded if lactose deficiency coexists (Table II) [39, 40].

Table II. FODMAPs-rich food and diagnosis

FODMAPs	Food sources rich in...	Diagnosis
FOS	wheat, rye, onions, garlic, artichoke	Food history
GOS	pulses	Food history
Lactose	milk, dairy	Breath test
Fructose	honey, apple, pears, watermelon	Breath test
Sorbitol	fruit with stone, candy/gums sugar-free, apple pears	Breath test
Mannitol	candy/gums sugar-free, mushrooms, sprouts, mint	Food history

FOS: Fructo-oligosaccharides; GOS: Galactooligosaccharides.

Irritable Bowel Syndrome

Irritable bowel syndrome is a functional gastrointestinal disorder which manifests symptoms of recurring abdominal pain relative to changes in intestinal habits without organic alterations. Its prevalence in the world population is approximately 11% with a female predominance of 14% with respect to 8.95% in males [22, 41].

In recent decades, many studies concerning the IBS physiopathology have been concentrated on motility disturbances of the colon, visceral hypersensitivity and brain-gut interaction. Nevertheless, recently, other mechanisms have been actively studied including inflammation, low-grade post-infection inflammation, immunological factors, alteration of the microbiota and dietetic factors [22, 42].

Irritable bowel syndrome, gut microbiota and probiotics

Traditionally, IBS has been considered to be more common in Western cultures. One theory suggests that the prevalence of gastrointestinal diseases generally increases with industrialization [43]. This could be explained by changes in diet, environmental factors or greater exposure to infections [43].

According to the Rome III criteria, IBS is defined as a condition characterized by unexplainable discomfort or pain present for at least 3 days a month in the last month and associated with two or more of the following conditions herein reported: the symptoms improve after defecation, alteration of the bowel habits regarding both the consistency of the feces and the frequency of evacuation [44]. It is classified as a functional disease since tests do not demonstrate diagnostic abnormalities and the diagnosis is based on the presence and characteristics of the symptoms [45, 46].

Approximately two-thirds of patients with IBS associate their symptoms with certain foods [47]. More than 60% report

the onset of symptoms after meals; of these, 28% manifest symptoms 15 minutes after having eaten while others manifest symptoms within 3 hours after a meal [45].

The patients tend to refer the presence of symptoms together with the assumption of food rich in lipids or poorly-absorbed carbohydrates [48, 49]. Oligosaccharides and polyols contribute to the symptoms of IBS with abdominal distension which produces pain, flatulence and alterations of the bowel habits [50].

Furthermore, approximately 50% of people with IBS report that food worsens the clinical picture, focusing therefore on the question of what role food plays in this context [1, 51].

Even if the response to food is not included in the diagnostic criteria for IBS, many people with IBS feel that diet plays a significant role in managing their symptoms. Changes in lifestyle which have been considered in treating IBS include small meals, increasing the consumption of fiber, and reducing fatty food, dairy products, carbohydrates, caffeine, alcohol and food with a high protein content [22, 52, 53].

While various articles speak about the role of dietetic changes in IBS, there is little available evidence regarding the food habits of patients with IBS, even if one article reports that people with IBS do not eat much fruit but more soft drinks and fast food [54, 55].

DIAGNOSTIC - THERAPEUTIC PROTOCOL

According to the available evidence [56, 57] a diagnostic algorithm may be suggested for identifying the presence of food adverse reactions in patients with gastrointestinal symptoms (Fig. 1).

The diagnostic-therapeutic protocol aimed at investigating adverse reactions to food initially involves careful evaluation of

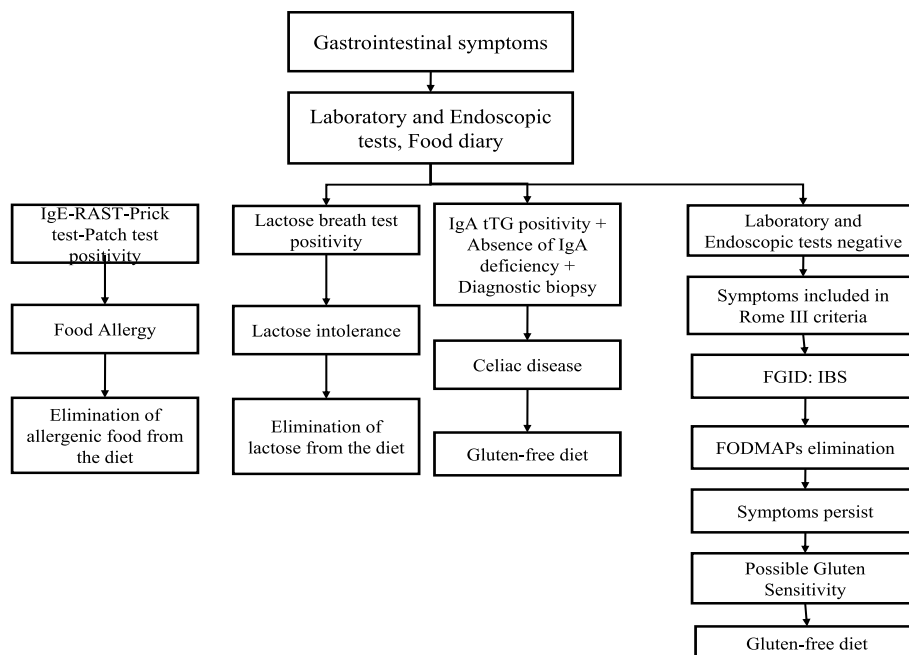


Fig. 1. Diagnostic-therapeutic protocol to assess food allergy/intolerance. Legend: FGID: functional gastrointestinal disease, IBS: irritable bowel syndrome, FODMAPs: Fermentable, Oligo-, Di-, Mono-saccharides And Polyols.

the symptoms and the clinical and dietetic history of the patient in order to guide the choice of successive investigations [58, 59].

In order to reach a diagnosis, a step-by-step procedure must be followed and the protocol will vary on the basis of reaching a possible solution and excluding hypotheses which do not lead to clinical confirmation.

FOOD ALLERGY

In order to exclude food allergies, it is necessary to proceed on the basis of the results of the following tests:

1) **Total serum IgE:** there is a correlation between the increased concentration of IgE and the probability that an individual has an adverse reaction to the ingestion of food [60].

2) **IgG:** testing for food-specific IgG typically yields multiple positive results which often represent a normal immune response to food. In fact, specific IgG4 antibodies are not predictive of food allergies, and national and international guidelines do not recommend IgG4 testing for food in an allergy workup [61].

3) **RAST** (radioallergosorbent test) of foods/serum food-specific IgE: it evaluates the presence of specific IgE antibodies in some foods or substances containing them. A direct correlation exists between increasing concentrations of food-specific serum IgE and the probability that an individual will react to an ingested food [12, 62, 63].

4) **PRICK test:** it is carried out by putting a standardized solution containing specific proteins of the food onto the skin and observing the cutaneous reaction in order to evaluate the positivity. The positivity will indicate the presence of IgE to specific foods [12, 62–65].

Since in several cases the serological pattern is negative while abdominal symptoms persist, different unconventional diagnostic methods have been proposed, although, up to now, no definitive evidence for their accuracy is available.

Unconventional diagnostic methods for allergic-immunologic conditions include cytotoxic tests, provocation-neutralization, electrodermal diagnosis, applied kinesiology assessments, and serum IgG or IgG4 testing [12, 64–66].

Electrodermal testing, also known as VEGA testing, is based on the false theory that an allergy produces a change in the electrical resistance in the skin. This involves placing the patient in the electrical circuit of a machine which uses a galvanometer to measure skin conductance. A food extract in a sealed glass vial is placed in contact with an aluminum plate within the circuit which is, in turn, in contact with the patient's skin. A galvanometer is used to measure the electrical resistance of the skin. A drop in electromagnetic conductivity, or a "disordered reading", indicates an allergy or intolerance to that allergen. Double-blind placebo-controlled studies on the diagnostic test accuracy revealed poor reproducibility of the method. It was ineffective in diagnosing allergies as it could not even distinguish between atopic and non-atopic participants, or between allergens and negative controls [69].

Electrodermal testing (Vega) cannot be recommended for the diagnosis of food allergies since it is without an established scientific basis and may therefore lead to inappropriate treatment [70].

Also in the case of other diagnostic methods, there is no recommendation for their clinical use since no evidence of diagnostic accuracy is available [71, 72].

Diet history

This includes analysis of the current intake as well as historical intake of any foods containing allergens and contact with nonfood items that could contain food allergens [73].

If the food investigation does not find a particular association between food and symptoms, the patient could be asked to keep a diary which reports exactly the food consumed and the symptoms present.

If the presence of allergies is found, it is necessary to evaluate the degree of severity and, from the dietary intake, an exclusion diet could be called for with the eventual successive gradual reinsertion of the excluded foods in the case that particularly serious symptoms, such as anaphylactic shock, are not present.

It should be remembered that 70% of people with allergy to pollen can present allergic symptoms consequent to the ingestion of food since cross-reactivity is induced by the presence of common epitopes [11]. A food diary reporting the foods and symptoms can be a valid instrument in identifying them.

If diagnostic research of the allergy is negative, the possibility of food intolerance should be taken into consideration.

Allergy to nickel

The diagnosis of ACD is performed by allergen patch testing which involves placement of the allergen onto the skin surface for 48 hours under occlusion, followed by removal of the patch and examination of the skin for inflammatory changes at the end of 48 hours and usually again 24 hours after the initial examination [18].

Systemic reactions to the ingestion of nickel-rich foods (gastrointestinal and skin) in nickel patch test-positive individuals characterize Systemic Nickel Allergy Syndrome (SNAS); the symptoms are correlated to the ingestion of nickel-containing foods and beverages [17]. Bloating, abdominal pain and diarrhea are frequent gastrointestinal symptoms [74–76]. The gastrointestinal symptoms are correlated to the ingestion of nickel-containing foods and beverages [17].

In patients with a nickel allergy, dietary avoidance would be recommended for a period of 6 to 8 weeks [77, 78].

FOOD INTOLERANCE

Specific diagnostic tests are necessary to confirm or exclude the diagnosis of food intolerance. In the case of negativity, a careful food investigation could be useful in order to understand whether or not the cause of the symptoms is related to food characteristics. If the results are positive, with the exception of celiac disease for which the only treatment is a gluten-free diet, there is an evaluation of the degree of intolerance with exclusion of the implicated food [40, 68, 79–81].

In general, it is important to remember that different degrees of intolerance exist, and therefore the quantity of food capable of triggering the symptoms can vary from person to person according to their individual tolerance [40]. It is useful, therefore, to identify the maximum quantity of food tolerable for each subject.

Lactose intolerance

Patients with lactose intolerance can often ingest up to 15g of lactose without symptoms or with minimal disturbances [82, 83].

One therapeutic strategy involves a diet with reduced amounts of lactose, with the insertion of low content of dairy products, thus avoiding the nutritional disadvantages of a reduced intake of calcium and vitamins [84]. The lactose breath test, which even today is the most reliable method, is used for the diagnosis [85, 86]; in the presence of an H₂ excretion greater than 20 parts per million, the suspicion of lactose intolerance is strong [34, 85, 86].

A negative breath test excludes the presence of lactose malabsorption and vice versa. The next step is that of determining whether the symptoms improve with a lactose-free diet; the patients whose symptoms improve with a lactose-free diet can be taught to ingest limited quantities (1 portion a day) of products containing lactose, gradually increasing assumption until the development of symptoms. With small quantities of food containing lactose, symptoms, such as diarrhea or abdominal pain, are very difficult to attribute solely to lactose intolerance [82].

Functional gastrointestinal diseases

The Rome III criteria [2] are used to identify patients with IBS. In these patients, if necessary on the basis of specific symptoms possibly related to food ingestion, after having excluded the presence of food allergy or intolerance and CD, it is then useful to investigate the occurrence of a hypersensitivity to FODMAPs or a gluten sensitivity.

Hypersensitivity to FODMAPs

The presence of intolerance/hypersensitivity to FODMAPs is evaluated by means of a careful food workup and, if found, a diet with reduced amounts of FODMAPs should be followed [87]. A diet with low amounts of FODMAPs is often used for the management of functional gastrointestinal symptoms in patients with IBS with positive results in terms of symptom reduction, choice of a healthier diet and better quality of life [68, 88, 89].

A low FODMAPs diet has been shown to be successful in diarrhea-predominant IBS. The exclusion of fermentable carbohydrates probably alleviates symptoms, such as bloating, diarrhea and pain. Complete eliminations of certain foods from the diet is very restrictive in the initial phase which can last from 2-4 weeks until symptoms are no longer present. Following this, there should be a gradual reinsertion of the food involved [40]. The breath tests can be associated with diets having a reduced content of FODMAPs because the presence of intolerance to fructose, lactose and sorbitol can be evaluated. It is important to remember that for fructans and galactooligosaccharides (GOS) no specific breath test exists but only an exclusion diet.

Gluten sensitivity

Currently, there are no known biomarkers for the diagnosis of NCGS but a reaction of antibody against gliadin (AGA-IgA) cannot be excluded [30, 90]. Some studies have indicated a correlation with first generation anti-gliadin antibodies [31, 90, 91]. The symptoms include gastrointestinal disturbances, such as bloating, diarrhea and abdominal pain, and also extraintestinal disturbances, such as mental confusion, headache, articular and muscular pain, symptoms which improve or disappear when gluten is eliminated from the diet

and recur if gluten is reintroduced [92, 93]. The clinical picture manifests itself a few hours or days after the consumption of foods containing gluten [94, 95]. Furthermore, it has been found that, in addition to gluten, amylase trypsin inhibitors (ATIs) can contribute to an increase in symptoms in celiac and NCGS patients (more sensitive to ATIs with respect to healthy patients) since they are strong activators of inflammation and immune reactions [94].

After having excluded the presence of CD and WA, the next step is to propose a diet with a low content of FODMAPs. Reducing foods with a high content of fructans automatically also reduces gluten with improvement of the symptoms present [68, 96, 97]. In a successive phase, if the symptoms persist, gluten must be completely excluded [98].

If the diagnosis is negative for food intolerance or hypersensitivity, genetic or environmental factors which influence the intestinal microbiota, favoring IBS and gastrointestinal symptoms, are taken into consideration. The patient's history and a food diary used to correlate food and symptoms constitute the guide for proposing a diet which excludes the foods involved. The role of dietary components in inducing gastrointestinal symptoms of abdominal pain, bloating, flatulence and altered bowel habits (in IBS) is difficult to explore. Evidence encourages researchers to further investigate the role of food intolerance as a major contributor to IBS symptoms [40].

Studies are required to assess the efficacy of a dietary approach characterized by the low food chemicals (such as salicylates, amines, and glutamates) [38]. A realistic and efficacious therapeutic approach for functional gastrointestinal symptoms would be that of utilizing food choices via low FODMAPs and other potential dietary strategies [38].

CONCLUSIONS

Despite the difficulty in evaluating the epidemiological impact of these diseases, an increasing tendency has been identified regarding the presence of food intolerance, allergies and IBS as a set of overlapping clinical pictures which are not always capable of leading to a definite diagnosis. A diagnosis can often be reached utilizing a carefully carried-out medical and dietetic history as well as a physical examination [70].

A dietetic history can be very important; it should include an examination of both recent and past food habits, the assumption of nutrients and the adequacy of the diet since nutritional state can be compromised due to the elimination of entire food groups with a consequent lack of fatty acids, proteins, calories and vitamins.

If the dietetic history does not indicate a clear association between food and symptoms, it could be useful to keep a food diary, listing the food, drink, condiments and dietary supplements consumed, the brand of the products, methods of preparation and the relationship between the food introduced and onset of the symptoms. Moreover, it is useful to evaluate the number of meals consumed outside the home and the use of prepackaged foods.

Nutritional intervention depends on the nutritional diagnosis; it can include all the indications useful in helping people to recognize and avoid possible exposure and also to

improve or maintain food adequacy on the basis of the needs of the patient. The benefits of an exclusion diet have to be such as to avoid monotonous and restrictive diets when not necessary [99].

It is important for the physician to have some guidelines regarding the evaluation of symptoms in order to set up the best diagnostic test strategy [100]. It is possible to proceed step-by-step with a careful evaluation of the signs and symptoms, the clinical and the nutritional history. The laboratory tests available, together with the patient's diary, will confirm or exclude the presence of allergy or intolerance and will permit the identification of the best therapeutic strategy, mainly in terms of dietary and life style advice.

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