

**Literacy in the multidisciplinary  
approach to food allergy**  
***Literacia na abordagem multidisciplinar  
à alergia alimentar***

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## Abstract

Prevalence of food allergy are increasing all over the world. The strict food avoidance necessary for the treatment of patients suffering from this condition is a very difficult process, requiring the assistance of health care professionals with experience in the field in a multidisciplinary approach, including Nutrition.

This review aims to clarify the literacy of health professionals (general practitioners, pediatricians, among others) regarding the clinical symptomatology, diagnosis, treatment and management of food allergy. The multidisciplinary approach in the treatment of food allergy will also be addressed, with a primary focus on the role of the nutritionists, school nurses and psychologists, beyond Immunoallergology and General Practice.

The implementation of training programs in this field is important to standardize the knowledge and behavior of professionals in the management of food allergy patients. Providing more accurate and consistent information enables an overall improvement in the management of food allergy in the community, with possible reduction in morbidity and mortality of these patients, particularly in the prevention of accidental exposure and anaphylaxis.

**Keywords:** Food Allergy, Health Literacy, Health Care Professionals, Multidisciplinary Team, Food allergy trainig program

## Resumo

A prevalência de alergia alimentar está a aumentar em todo o mundo. A restrita evicção alimentar necessária para o tratamento dos doentes que sofrem com esta condição é um processo complexo, carecendo de acompanhamento de profissionais de saúde com experiência na área numa abordagem multidisciplinar, incluindo a Nutrição.

Esta revisão visa clarificar a literacia de profissionais de saúde (médicos de clínica geral, pediatras, entre outros) em relação à sintomatologia clínica, diagnóstico, tratamento e gestão da alergia alimentar. A abordagem multidisciplinar no tratamento da alergia alimentar também será abordada, com enfoque principal nas áreas da Nutrição, Enfermagem Escolar e Psicologia.

A implementação de programas de formação neste campo é importante de forma a padronizar os conhecimentos e competências dos profissionais na gestão de pacientes com alergia alimentar. O fornecimento de informações mais precisas e consistentes possibilita uma melhoria global de gestão de alergia alimentar na comunidade, com possível redução da morbilidade e mortalidade destes doentes, nomeadamente na prevenção de exposição acidental e anafilaxia.

**Palavras-chave:** Alergia Alimentar, Literacia em saúde, Profissionais de saúde, Equipa Multidisciplinar, Programa de treino em alergia alimentar

## Abbreviations

**CMA**- Cow's milk allergy

**EAACI**- European Academy of Allergy and Clinical Immunology

**FA**- Food Allergy

**IgE**- Immunoglobulin E

**USA**- United States of America

**WHO**- World Health Organization

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## 1. Introduction

Food allergy (FA) is defined as an adverse reaction to food mediated by an immunologic mechanism, involving specific IgE (IgE-mediated), cell-mediated mechanisms (non-IgE-mediated) or both IgE- and cell-mediated mechanisms (mixed IgE- and non-IgE-mediated).<sup>(1)</sup> It is a serious and growing public health problem, affecting more than 200 million individuals worldwide <sup>(2)</sup>, being considered one of the most common chronic non-communicable diseases in children.<sup>(3)</sup> The prevalence of FA in adults is around 5% and in children this value is higher: at least 8 out of 100 children have FA.<sup>(4)</sup> Substantial increases in hospital admissions worldwide have been reported.<sup>(5)</sup>

Although almost any food can cause an allergic reaction, most 8 are responsible for about 90% of allergic reactions: cow's milk, eggs, peanuts and nuts, fish, shellfish, wheat and soy.<sup>(2, 6, 7)</sup> The intake of these foods in allergic people results in symptoms that can be cutaneous (angioedema, hives and flushing), respiratory (wheeze, dyspnea and cyanosis), gastrointestinal (swelling of lips/tongue/uvula, nausea and abdominal cramps) and cardiovascular (increased heart rate, low blood pressure and dizziness).<sup>(8)</sup> Anaphylaxis is a severe, potentially life-threatening systemic hypersensitivity reaction. This is characterized by being rapid in onset with life threatening airway, breathing, or circulatory problems and is usually, although not always, associated with skin and mucosal changes.<sup>(9)</sup>

As the clinical presentation of food allergy reactions varies within wide ranges the diagnosis may be difficult <sup>(2)</sup> and may comprises different tools as

clinical history, prick tests, specific serum immunoglobulin E (IgE) searching, elimination diets and oral food challenges are important FA diagnostic tools.<sup>(2, 8)</sup>

Currently, allergen avoidance remains the first-line treatment in FA as well as the use of the adrenaline pen in case of an anaphylactic reaction.<sup>(6)</sup>

Managing FA can become a complicated task. This management implies the need for education of different target audiences such as the individuals at risk and their families, their peers, school personnel, school nurses and restaurant staff.<sup>(1)</sup> In this area, some work has been done so that effective FA management in the community becomes a reality.<sup>(10-16)</sup>

To keep FA sufferers safe as well as to avoid unnecessary food restrictions, proper diagnosis and management of FA by healthcare professionals is crucial.<sup>(3)</sup> However, health professionals admit that there are considerable gaps in their knowledge about FA.<sup>(17, 18)</sup>

This thematic review aims to investigate health professionals' knowledge about FA as well as to emphasize the importance of a multidisciplinary team in the treatment of FA.

## **2. Review Methods**

The databases used for this thematic review were “*Pubmed*”, “*Scopus*”, “*ScienceDirect*” and “*EBSCO*”. A combination of the following terms was used : “*health literacy*”; “*health literacy AND intervention*”; “*food allergy*”; “*food allergy literacy*”, “*food allergy literacy AND intervention*”; “*food allergy OR food allergies AND health professionals AND intervention OR program*”; “*food allergy AND multidisciplinary team*”.

The literature research was conducted between May and August 2021, giving preference to articles published from 2016 onwards. References of the



articles initially selected were also analysed and, in some cases, included. Articles that, after reading the abstract and discussion, did not correspond to the objectives of this review were not included.

To export and manage references, the *EndNote X9 Software* was used, which allowed the elimination of duplicates and obtaining full texts.

### **3. Health literacy**

Health literacy is defined by the World Health Organization (WHO) as the set of cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways that promote and maintain good health.<sup>(19)</sup>

In response to surveys that have indicated high rates of poor health literacy in populations, governments and national agencies in many countries have developed national strategies and targets to improve health literacy in their populations. However, this type of strategies are not emerging as quickly as needed and, because of that, should become a priority in the research area.<sup>(20)</sup>

Individuals with low health literacy have more difficulty finding providers and generally have a delay getting care than those with adequate health literacy.<sup>(21)</sup> Furthermore, low health literacy is associated with increased use of treatment and emergency services rather than preventive services besides the barriers in language and communication that could exist and that make difficult the treatment adherence.<sup>(22)</sup>

A recent study done in Portugal<sup>(23)</sup> and based on Action Plan for Health Literacy 2019- 2021<sup>(24)</sup> and European consortium WHO Action Network on Measuring Population and Organizational Health Literacy (M-POHL)<sup>(25)</sup> concluded

that, although efforts are being made to improve health literacy, about 30% of the Portuguese population was classified as having an inadequate or problematic level of health literacy. Another Portuguese study found that academic training in health correlates with higher health literacy.<sup>(26)</sup>

#### **4. Food allergy literacy**

##### **4.1. Food allergy literacy in the community**

Parents and caregivers are probably the ones who spend the most time with children with food allergies. Because of this, they should have high literacy related to FA management. However, recent studies show that this is not a reality and that there is a lack of FA literacy among parents and caregivers.<sup>(27-29)</sup> Parents with less general knowledge about food allergies seem to be more likely to indicate that their child does not need to avoid a certain item when the child really needs to avoid it. These children are at greater risk of accidental exposure to allergens, and this can have fatal consequences.<sup>(30)</sup>

School is a place prone to allergic reactions as students spend most of their day there. Every year, 1 in 10,000 children experience an anaphylactic food reaction, with most of these events occurring during school hours.<sup>(31)</sup> For this reason, teachers and school staff are often the first to help students during an acute phase of an allergic episode. *Dumeier et al* showed that preschool teachers' knowledge about triggers, allergy prevalence, and administration of adrenaline auto-injectors was insufficient.<sup>(32)</sup> A study developed in Spain confirmed these results, showing that teachers have little knowledge about managing anaphylactic reactions: only 5% knew how to use an adrenaline auto-injector, 25% did not know that the injection was given in the thigh, and almost all the teachers needed to read the instructions before administering the adrenaline.<sup>(33)</sup>

Allergic reactions in restaurants are common and can be severe.<sup>(34)</sup> Miscommunication or errors due to gaps in knowledge can lead to accidental exposures and allergic reactions<sup>(35)</sup> as well as cross contact at the time of preparation and service.<sup>(34)</sup> Many of the workers (72%) had limited knowledge and poor practices related to FA.<sup>(36)</sup> Similar results are seen in a study by *McAdams et al.* in Ontario, Canada.<sup>(37)</sup> Furthermore, many of the participants incorrectly believed that there can be consumption of small amounts of foods to which they are allergic, denoting a lack of confidence in dealing with a FA emergency.<sup>(37)</sup>

Managing FA in the community is a challenge because it includes the interaction of various groups such as parents and caregivers, school staff and restaurant staff, but it is essential for patients with food allergies to have a higher quality of life and live safely.<sup>(1)</sup>

## 4.2. Food allergy literacy in health care professionals

### 4.2.1. General knowledge

Healthcare professionals are, for patients with food allergy and their caregivers, a trustable and immeasurable source of help and guidance. For that reason, they should be the ones that possess the theoretical knowledge needed to be able to enlighten parents and caregivers, as well as the rest of the food allergy community. However, some studies confirm that there is a lack of resources related to FA in the area of health education<sup>(38)</sup> as well as a lack of theoretical knowledge.<sup>(39)</sup>

Parents and caregivers seem to be confused when health professionals show heterogeneity in their knowledge, attitudes and perceptions regarding FA.<sup>(40)</sup> Health professionals as well as families and caregivers use additional sources of

information that are not consistent with each other, which, together with constant changes in the guidelines, seems to result in contradictory information causing confusion in the patient and their respective family or caregivers. Finland public health nurses and general practitioners do not recognize many of the symptoms indicative of FA, which can result in unnecessary dietary restrictions. These gaps in knowledge are alarming because they indicate that health care professionals are not able to recognize allergy, potentially delaying its treatment, and that they are not able to teach families and caregivers to recognize allergy episodes. <sup>(40)</sup>

A study carried out in Turkey evaluated the knowledge of nutritionists and dietetic students about FA. <sup>(41)</sup> 60% of the respondents defined their knowledge of FA and managing patients' dietary needs as moderate even though half of the respondents did not know that margarine contains milk protein. Only 72% of the respondents correctly answered the questions about foods that can cause anaphylaxis, and 43% of these did not recognize that food allergens can be transmitted through kitchen utensils. In addition, 60% of the respondents think that touching food never causes allergic reactions, and 43% think that smoke from cooking food does not cause allergies. It is also important to note that 39% thought that lactose-free formulas can be given to patients with cow's milk allergy. <sup>(41)</sup> Nutritionists seem to have gaps regarding FA prevention. <sup>(17)</sup> Nutritionists were the professionals who most agreed with the recommendation of a maternal exclusion diet during pregnancy (26%) and lactation (59%), even though there was no scientific support for this. <sup>(17)</sup>

Educational deficiencies in fulcral areas regarding food allergy make it impossible for school nurses to properly manage the topic. <sup>(38)</sup> Training and

delegation of responsibilities for teachers and school staff, development of emergency plans, cross contamination and cleaning of food areas are critical areas. Nurses also reported a lack of proficiency in developing guidelines on the prohibition of specific foods and in planning school trips and outside activities for students with food allergies.<sup>(38)</sup> *Twichell et al* confirmed the existence of knowledge deficits and mixed attitudes.<sup>(42)</sup> General knowledge about FA and FA treatment were the areas where the greatest gaps were noted, with epinephrine recognized by more than half of the nurses as an extremely dangerous drug with many side effects. In addition, many nurses stated that antihistamines should always be the first-line treatment in case of an allergic reaction to food, and many thought it was unsafe to give a second dose of epinephrine if symptoms persist.<sup>(42)</sup>

Also Physicians seem to have knowledge gaps in the treatment and management of FA. More than half of the family physicians in this study answered all the questions incorrectly, and the lack of knowledge was across all age groups, regardless of length of professional experience.<sup>(43)</sup> *Jain et al* concluded that, although there seems to be a high level of knowledge among physicians in Hyderabad, there are differences in knowledge among them, resulting in dissimilarities in approach to clinical practice.<sup>(44)</sup>

Pediatricians are often the first professionals that parents and caregivers turn to, when a child appears to have a FA. Their expertise in the area of FA has been extensively studied, but in the vast majority of cases, it is unsatisfactory. Australian pediatricians claim that their knowledge of FA is not the best and that they would benefit from additional training in the area <sup>(45)</sup>, a view also shared by pediatric residents in Qatar, who say that it is important for them to pass through

the allergy/immunology specialty during their residency years.<sup>(3)</sup> The areas of clinical presentation, diagnosis, treatment, and prevention of FA seem to be problematic in terms of pediatricians' knowledge, according to Al-Herz et al.<sup>(46)</sup> Pediatricians believed that behavioural disorders and hyperactivity are frequent manifestations FA and that the use of antihistamines prevents anaphylaxis. They also believe that patients with CMA should drink goat's or sheep's milk to prevent nutritional deficiencies and that the use of soy formulas and amino acids early in life prevents the development of FA, which is confirmed by a study developed in Turkey.<sup>(47)</sup> This lack of knowledge leads to a significant delay in the diagnosis of FA, which can further increase morbidity.<sup>(46)</sup> Cow's milk allergy (CMA) is the most common childhood allergy.<sup>(48-50)</sup> One in four Spanish pediatric gastroenterologists consider their knowledge of CMA to be insufficient and outdated, even though almost all of them are aware of the existence of guidelines.<sup>(51)</sup>

A study conducted in Chicago that aimed to determine pediatricians' adherence to guidelines released by the National Institute of Allergy and Infectious Diseases <sup>(52)</sup>, concluded that the role of the pediatrician needs to be better established in order to improve pediatrician adherence and knowledge.<sup>(53)</sup> Although there was a high referral rate to allergists (70%), pediatrician compliance related to prescribing epinephrine auto-injectors (45%), documenting reaction histories (39%), appropriate use of diagnostic tests (35%), and counselling the patient's family on FA management (25%) was considerably lower.<sup>(53)</sup> A few years later, the adherence of Brazilian pediatricians <sup>(54)</sup> to international guidelines was evaluated.<sup>(55-63)</sup> Only 69 of 415 pediatricians had a satisfactory adherence rate, with the questions with the lowest compliance rate being the ones assessing the need for oral food challenge for CMA and the indication to prescribe calcium

supplementation in CMA.<sup>(54)</sup> In the United States of America (USA), adherence to the Peanut Allergy Prevention Addendum Guidelines<sup>(64)</sup> was evaluated <sup>(65)</sup>. 93% of the participants were aware of the guidelines but only 29% of these were implementing them fully and 64% only partially. Almost all pediatricians reported a need for more training regarding the guidelines.<sup>(65)</sup>

#### 4.2.2. Anaphylaxis and emergence knowledge

Anaphylaxis is defined as a severe and potentially fatal systemic hypersensitivity reaction. It is characterized by rapid onset with life-threatening respiratory or circulatory problems, and is usually, though not always, associated with skin and mucosal changes.<sup>(9, 66, 67)</sup> According to the European Anaphylaxis Registry, the most common cause of anaphylaxis in children is food allergies.<sup>(68)</sup>

Admissions for anaphylaxis that occurred between 1998-2018 in the UK were analysed. Of the 101,891 hospitalizations for anaphylaxis, 30,700 (30.1%) were food related. Admissions for food anaphylaxis increased by 5.7% annually, with the group of children under 15 years old having the greatest increase. <sup>(69)</sup> Also in Portugal, a national reporting system for anaphylaxis was implemented for 10 years.<sup>(70, 71)</sup> This was the first national registry of anaphylaxis in pediatric age and confirmed FA as the main inducer of anaphylaxis in children and adolescents. Only 46% of admitted patients received treatment with adrenaline, reflecting its underutilization in the emergency room, and this may be related to insufficient medical education.<sup>(70, 71)</sup>

In the area of managing episodes of food anaphylaxis, the literature shows that there is a lack of knowledge. General practitioners, pediatricians, allergists, school doctors and mother and child care doctors and pediatric junior doctors

responded to a questionnaire in order to ascertain their knowledge about diagnosis and management of anaphylaxis.<sup>(72)</sup> 74% of respondents chose antihistamines and bronchodilators as first-line treatment in case of an anaphylactic reaction, and 22% would not administer intramuscular adrenaline without first calling the emergency ward. With this study, it was possible to identify a gap in the need for an immediate call to medical emergency as well as the minimum observation time after an episode of food anaphylaxis (6 to 8 hours), according to the European Academy of Allergy and Clinical Immunology (EAACI) guidelines.<sup>(9)</sup> In the same year, Russian physicians were subjected to a similar evaluation, finding that 67% of the participants did not recognize that it was an anaphylactic reaction even in the face of a very obvious clinical scenario, and only 15% suggested intramuscular injection of adrenaline as the treatment of first choice.<sup>(73)</sup> Overall, only 10% of participants were able to diagnose and provide appropriate treatment for a child with food-induced anaphylaxis. It was also possible to conclude, from a study of USA pediatric residents, that the more atypical the anaphylaxis scenario the less likely the residents were to recognize and treat the episode.<sup>(74)</sup> In cases where there was anaphylaxis without respiratory symptoms, only 30% of the residents were able to identify it as anaphylaxis. The opposite scenario was also described as 21% of residents classified cases as anaphylaxis that were not, according to the National Institute of Allergy and Infectious Diseases and Food Allergy and Anaphylaxis Network criteria.<sup>(75)</sup> Papers reinforce the need for simple diagnosis of anaphylaxis as well as continuing education regarding epinephrine as first-line treatment in anaphylaxis.<sup>(76, 77)</sup>

## **5. Importance of the multidisciplinary team**



Teamwork in healthcare has the primary function of prioritizing the patient, placing him at the center of care. Allied health professionals (AHPs), including nurses, nutritionists, psychologists, and physicians allow a combination of specialized knowledge and skills, which allows patients with food allergies to receive more complete and specific care.<sup>(78, 79)</sup> For effective FA management be possible, it must involve a partnership between primary care and specialist care.<sup>(7, 80)</sup>

### 5.1. The role of Nutrition in Food Allergies

When food is the aggressor, there are several nutritional challenges that patients face for the proper management of their condition, and often incorrect dietary management can lead to dietary gaps and nutritional deficiencies.<sup>(81)</sup>

*Meyer et al.* showed that food avoidance, strictly necessary for the management of FA, increases the risk of poorer growth in children.<sup>(82)</sup> This study provided, for the first time, worldwide data on the growth of children with FA and concluded that 6% of the children were underweight, 9% were stunted, 5% were malnourished, and 8% were overweight. Children with CMA as well as those with non-IgE mediated allergies and mixed allergies (IgE mediated and non-IgE mediated) are at increased risk. According to a study in the journal *Pediatric Allergy and Immunology*<sup>(83)</sup>, all health professionals should be aware of the importance of regularly monitoring the growth of children with FA, and the dietitian should have the key role of instructing how food intake should be done, suggesting any necessary supplementation but more importantly, supporting patients and caregivers in preventing and managing difficulties that may arise in feeding.

According to *Ruth P. Charles* <sup>(84)</sup>, registered dietician and specialized in pediatric nutrition, the nutritionist is a qualified, experienced and competent professional in the management of FA, presenting several skills that allow him/her to help the patient with FA and his/her caregivers. Assessing the patient's current growth and growth trends to date, assessing nutritional adequacy or deficiency according to the patient's age, identifying economical and safe sources of allergen-free foods, helping identify and manage risks of exposure to food allergens, developing and implementing a nutritional care plan that focuses on the child with FA and their caregivers and helping them understand allergen statements, thus helping to reduce anxiety and financial costs associated with FA management, are some of the many added value a dietitian can bring to the life of someone with FA. The nutritionist has the opportunity to apply his/her skills in various areas such as suggesting safe and nutritious alternatives to allergens, reading labels, eating out and helping with allergen management in schools, thus demonstrating a role at the community level.<sup>(85)</sup>

## 5.2. The role of School Nurses in Food Allergies

School nurses play a key role in managing FA in schools including creating individual care plans that enable the provision of a safe environment for children with FA, planning an appropriate response in the event of an emergency, and training of other professionals working in the school.<sup>(38)</sup> School nurses are uniquely prepared to ensure an immediate response in case of allergen exposure as well as to administer epinephrine in life-threatening situations.<sup>(86)</sup> However, not all schools have school nurses and therefore efforts should be made to increase the number of these professionals, ensuring a faster and more efficient management of FA at the school level.<sup>(87, 88)</sup>

### 5.3. The role of Psychologist in Food Allergies

FA can cause feelings of anxiety and stress in patients and their caregivers due to its unpredictable and potentially life-threatening nature.<sup>(89)</sup> The varied and complicated emotions that families and caregivers of FA patients go through require understanding and guidance from mental health professionals, and there are reports of parents asking their allergists for a referral to a psychologist.<sup>(90)</sup> One study showed that students with food allergies are subject to a higher degree of bullying than students without this condition. Students who suffer from bullying are at higher risk of developing depression, anxiety, and other mental health problems which makes approaches to positively help those living with FA extremely necessary.<sup>(91)</sup> Not only patients but also parents and caregivers manifest being psychologically affected by FA. *Roberts et al.* showed that a large proportion of parents of children with FA reported worry, anxiety and/or post-traumatic stress disorder.<sup>(92)</sup> It has been shown, through a brief psychological intervention for mothers of children with FA, that the information given at the time of allergy diagnosis, as well as all the interventions that can be made within this framework, can have long-term effects on maternal psychological well-being, with a significant reduction in anxiety and a reduction in the stress response in a scenario of simulated anaphylaxis.<sup>(89)</sup>

## 6. Critical Analysis and Conclusions

FA studies have increased exponentially in recent years, perhaps due to the increasing prevalence of the disease worldwide.<sup>(2)</sup> The literature has focused on studying FA literacy in the community including schools, restaurants and parents and caregivers. However, studies that address the literacy of health care

professionals are scarce. The systematization of the results of studies on the assessment of food allergy literacy in health professionals and in the community is shown in table 1.

After analyzing the existing studies in the area of health professionals' FA literacy, we can confirm that they fall short of what we would expect. The professionals have low levels of FA literacy<sup>(43)</sup>, have poor adherence to guidelines issued by official entities <sup>(65)</sup> and show heterogeneity in knowledge and attitudes regarding FA <sup>(40)</sup>. This is a serious situation because it not only demonstrates the lack of preparation that those responsible for caring patients with FA have, but it can also mean a delay in the diagnosis of allergy, with possible impairment of the health of the FA patient.

The vast majority of studies on health professionals' literacy about FA have been done in pediatricians. There is a need to explore more knowledge of other professionals, especially professionals directly related to FA management such as nutritionists/dietitians. Although these are studies from different countries and continents, almost all of them present the same conclusions, denoting a need for more specific and targeted training in FA. Programs that allow greater standardization of knowledge and behavior of professionals in cases of FA should be more frequent.

Multidisciplinary teamwork is essential in the management of FA. In addition to immuno-allergologists, GPs (general practice or physician) and pediatricians also nutritionists/dietitians, school nurses and psychologists should be included in FA management. Nutritionists/dietitians play a key role in preventing possible nutritional deficits resulting from allergen withdrawal and allergen-containing products, reading and interpreting labels and working with

parents and caregivers to develop a safe eating plan for the patient. School nurses are important in ensuring proper FA management in schools, providing a safe environment for students suffering with this disease. Students with FA are known to express feelings of anxiety and stress, feel socially isolated and often suffer from bullying, which can increase the risk of developing depression. Therefore, it is important that psychology professionals be included in the treatment of patients with AF. This area has been poorly explored in Portugal yet, therefore food allergy tools that assess the professionals' baseline knowledge, followed by a training program course, with final evaluations as well, could be a good strategy to improve food allergy literacy and multidisciplinary clinical approach. In Portugal, we have an example of a tool applied in the area of schools and restaurants - Food Allergy Community Program <sup>(93, 94)</sup>, including Nutritionists as participants, that showed to improve the knowledge as well as the increase in the percentage of correct answers for each item of the questionnaires, showing that the interventions were effective in enhancing professionals' knowledge- that after being adapted for health professionals, will certainly be an added value in the FA community.

What this review adds	Future perspectives
<ul style="list-style-type: none"> <li>• Knowledge of health professionals regarding food allergy is poor.</li> <li>• There is little adherence of professionals to the guidelines of official entities.</li> <li>• Health professionals show heterogeneity in knowledge and clinical practice regarding food allergy.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase theoretical and practical component of food allergy in the training of health professionals.</li> <li>• Develop an online educational tool and understand the impact of this tool on the knowledge of health professionals through a before and after evaluation.</li> </ul>

Figure 1. Main results of the study and prospects for the future

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## APPENDIXES

Table 1. Summary of results from community food allergy literacy studies

Article	Authors	Year	Participants	Results
Food allergy education for school nurses: a needs assessment survey by the consortium of food allergy research [38]	Carlisle, S.K. Vargas, P.A. Noone, S. Steele, P. Sicherer, S.H. Burks, A.W. Jones, S.M.	2010	School Nurses	Educational deficiencies in training and delegation of responsibilities for teachers and school staff, development of emergency plans, cross contamination and cleaning of food areas; Lack of proficiency in developing guidelines on the prohibition of specific foods and in planning school trips and outside activities for students with food allergies.
Knowledge and practice of physicians and nutritionists regarding the prevention of food allergy [17]	Ribeiro, C. C. Speridião, P.G. de Moraes, M. B.	2013	Pediatricians Pediatric gastroenterologists Allergists Nutritionists	Nutritionists were the professionals who most agreed with the recommendation of a maternal exclusion diet during pregnancy (26%) and lactation (59%), even though there was no scientific support for this.
Food allergy diagnosis and management practices among pediatricians [53]	Gupta, R. S. Lau, C. H. Dyer, A. A. Sohn, M. W. Altshuler, B. A. Kaye, B. A. Necheles, J.	2014	Pediatricians	Although there was a high referral rate to allergists (70%), pediatrician compliance related to prescribing epinephrine auto-injectors (45%), documenting reaction histories (39%), appropriate use of diagnostic tests (35%), and counseling the patient's family on FA management (25%) was considerably lower.

Management of food allergy: a survey of Australian paediatricians [45]	Morawetz, D. Y. Hiscock, H. Allen, K. J. Davies, S. Danchin, M. H.	2014	Pediatricians	General pediatricians diagnosis and management is often inconsistent with international guidelines.
International survey of knowledge of food-induced anaphylaxis [39]	Wang, J. Young, M. C. Nowak-Węgrzyn, A.	2014	Physicians Allied health professionals Health professions (psychologist, optometrist, dentist/oral health professional) Medical students Non-health individuals (health business/administration, consumer/other, and media/press)	Specific knowledge deficits for food-induced anaphylaxis persist across all groups. 55% correctly recognized the case without skin symptoms as anaphylaxis. Only 23% of responders correctly selected risk factors for anaphylaxis, with physicians significantly more likely to choose the correct answers as compared to allied health, other health professionals and medical students ( $p < 0.001$ ). When presented a case of a child with no documented history of allergies who has symptoms of anaphylaxis, more physicians than any other group chose to administer stock epinephrine (adrenaline).
Food allergy knowledge and attitudes among school nurses in an urban public school district	Twichell, S. Wang, K. Robinson, H. Acebal, M. Sharma, H.	2015	School Nurses	Food allergy knowledge deficits and mixed attitudes exist related to management of reactions and perceptions of parents.

[42]				
The importance of educating postgraduate pediatric physicians about food allergy [3]	Adeli, M. Hendaus, M. A. Abdurrahim, L. I. Alhammadi, A. H.	2016	Pediatricians	56% of participants stated that they have not received formal education on how to recognize and treat food allergies, while 59% claimed not being trained on how to administer injectable epinephrine. 60% of all participants expressed the need of additional information about recognizing and treating food allergies.
The level of knowledge of dietitians about dietary management of children with food allergy [41]	Giniş, T. Koç, N. Güvenir, H. Cetin, C. Toyran, M. Civelek, E. Kocabas, C.	2016	Nutritionists Dietetic students	Half of the respondents did not know that margarine contains milk protein. 43% of these did not recognize that food allergens can be transmitted through kitchen utensils. 60% of the respondents think that touching food never causes allergic reactions, and 43% think that smoke from cooking food does not cause allergies. 39% thought that lactose-free formulas can be given to patients with cow's milk allergy.
Awareness of food allergies: a survey of pediatricians in Kuwait [46]	Al-Herz, W. Husain, K. Al-Khabaz, A. Moussa, M. A. A. Al-Refaei, F.	2017	Pediatricians	The knowledge in the areas of clinical presentation, diagnosis, treatment, and prevention of FA seem to be problematic.

<p>A national survey of Russian physicians' knowledge of diagnosis and management of food-induced anaphylaxis [73]</p>	<p>Munblit, D. Treneva, M. Korsunskiy, I. Asmanov, A. Pampura, A. Warner, J. O.</p>	<p>2017</p>	<p>Physicians</p>	<p>67% of the participants did not recognize that it was an anaphylactic reaction and only 15% suggested intramuscular injection of adrenaline as the treatment of first choice.</p>
<p>The gaps in anaphylaxis diagnosis and management by french physicians [72]</p>	<p>Pouessel, G. Galand, J. Beaudouin, E. Renaudin, J. M. Labreuche, J. Moneret-Vautrin, D. A. Deschildre, A.</p>	<p>2017</p>	<p>General Practitioners Pediatricians Allergists School doctors and mother and child care doctors Pediatric junior doctors</p>	<p>74% of respondents chose antihistamines and bronchodilators as first-line treatment in case of an anaphylactic reaction and 22% would not administer intramuscular adrenaline without first calling the emergency ward. This study identified a gap in the need for an immediate call to medical emergency as well as the minimum observation time after an episode of food anaphylaxis (6 to 8 hours).</p>
<p>Knowledge of allergies and performance in epinephrine auto-injector use: a controlled intervention in preschool teachers [32]</p>	<p>Dumeier, H. K. Richter, L. A. Neininger, M. P. Prenzel, F. Kiess, W. Bertsche, A. Bertsche, T.</p>	<p>2018</p>	<p>Preschool teachers</p>	<p>The knowledge about triggers, allergy prevalence, and administration of adrenaline auto-injectors was insufficient.</p>

<p>Allergists' opinions on anaphylaxis and epinephrine administration—a case-based survey [77]</p>	<p>Lieberman, J. A. Lieberman, P. Wang, J.</p>	<p>2018</p>	<p>Allergists</p>	<p>There are significant disparities amongst allergists regarding the diagnosis and treatment of anaphylaxis.</p>
<p>Cow's milk allergy as viewed by family physicians [43]</p>	<p>Özkars, M.</p>	<p>2018</p>	<p>Family Physicians</p>	<p>More than half of the family physicians in this study answered all the questions incorrectly, and the lack of knowledge was across all age groups, regardless of length of professional experience.</p>
<p>Manejo de la alergia a proteína de leche de vaca por los gastroenterólogos españoles [51]</p>	<p>Pérez, A. I. Sánchez, A. Cantón, O. Jaime, B. Treviño, S. García, C. Martín, J. J</p>	<p>2018</p>	<p>Pediatric Gastroenterologists</p>	<p>One in four pediatric gastroenterologists consider their knowledge of CMA to be insufficient and outdated, even though almost all of them are aware of the existence of guidelines. 33% consider that oral provocation is always necessary for the diagnosis of CMA, 25% consider that clinical improvement after the withdrawal of cow's milk proteins is sufficient for the diagnosis.</p>
<p>Parental confusion may result when primary health care professionals show heterogeneity in their knowledge, attitudes, and perceptions</p>	<p>Yrjänä, J. M. S. Bloigu, R. Kulmala, P.</p>	<p>2018</p>	<p>Public Health Nurses General Practitioners</p>	<p>The knowledge score was significantly higher among the general practitioners than among the nurses. Health professionals do not recognize many of the symptoms indicative of FA, which can result in unnecessary dietary restrictions.</p>



regarding infant nutrition, food allergy, and atopic dermatitis [40]				
Evaluation of the Knowledge of Cow's Milk Allergy among Pediatricians [47]	Can, C. Altınel, N. Shipar, V. Birgül, K. Bülbül, L. Hatipoğlu, N. Hatipoğlu, S.	2019	Pediatric Residents Pediatricians	Professionals believe that behavioral disorders and hyperactivity are frequent manifestations FA, that patients with CMA should drink goat's or sheep's milk to prevent nutritional deficiencies and that the use of soy formulas and amino acids early in life prevents the development of FA.
Level of competence of primary and secondary school teachers in the management of anaphylaxis [33]	Cantariño, S. F. Novío, S.	2019	Primary and Secondary School Teachers	Only 5% knew how to use an adrenaline auto-injector, 25% did not know that the injection was given in the thigh, and almost all the teachers needed to read the instructions before administering the adrenaline.
Assessment of Pediatrician Awareness and Implementation of the Addendum Guidelines for the Prevention of Peanut Allergy in the United States [65]	Gupta, R. S. Bilaver, L. A. Johnson, J. L. Hu, J. W. Jiang, J. Bozen, A. Martin, J.	2020	Pediatricians	93% of respondents were aware of the guideline. Of those who had knowledge of the guidelines, 29% were fully implementing them and 64% were partially implementing them.

	Reese, J. Cooper, S. F. Davis, M. M. Togias, A. Arbes, S. J., Jr.			
Knowledge, attitude, and practices of medical clinicians regarding food allergy and anaphylaxis in Hyderabad, India [44]	Jain, P. D. Gupta, R. S. Chadha, A. S. Warren, C. M. Rao, V. V. Putcha, U. K.	2020	General Practitioners Pediatricians Pulmonologists Dermatologists Gastroenterologists	Knowledge about food allergy among professionals was high but there are differences in the level of knowledge among them, which reflects differences in attitude and approach towards their patients.
Examining Differences in Parent Knowledge About Pediatric Food Allergies [27]	Luke, A. K. Flessner, C. A.	2020	Parents	Sub-optimal knowledge among parents, related to a worrisome lack of retention and/or recall of health facts about food allergy among parents.
Brazilian pediatricians' adherence to food allergy guidelines-A cross-sectional study [54]	Vieira, S. C. F. Santos, V. S. Franco, J. M. Nascimento-Filho, H. M. Barbosa, K. Lyra-Junior, D. P. Bastos, K. A. Cipolotti, R. Wayhs, M. L. C.	2020	Pediatricians	Only 69 of 415 pediatricians had a satisfactory adherence rate, with the questions with the lowest compliance rate being the ones assessing the need for oral food challenge for CMA and the indication to prescribe calcium supplementation in CMA.

	Vieira, M. C. Solé, D. de Moraes, M. B. Gurgel, R. Q.			
Impact of a web-based program to improve food allergy management in schools and restaurants [94]	Pádua, I. Moreira, A. Moreira, P. Barros, R.	2020	Registered dietitians Schoolteacher Health student Foodservice worker Health professional School worker Other	The participants' score in the knowledge test increased significantly after the course. The knowledge score at the initial and final evaluation was, respectively, 12 and 16 points, for schools, and 13 and 16 points, for restaurants.
What Is Anaphylaxis? Pediatric Residents' Perception and Treatment of Anaphylactic Reactions [74]	Ferdman, R. M.	2021	Pediatric Residents	In cases where there was anaphylaxis without respiratory symptoms, only 30% of the residents were able to identify it as anaphylaxis. 21% of the residents classified cases as anaphylaxis that were not, 14% allowed the patient to eat the peanut again and 24% would not prescribe epinephrine on follow-up.
Pediatrician perspectives on symptom presentation and treatment of acute allergic reactions [76]	Lieberman, J. A. Camargo, C. A., Jr. Pistiner, M. Wang, J.	2021	Pediatricians	There is disagreement among pediatricians about when an allergic reaction is considered anaphylaxis and when epinephrine is warranted.

Which foods should a child with food allergy avoid? The role of parental knowledge in food avoidance appraisals [30]	Steiner, E. M. Weiss Byrne, D. Dahlquist, L. M. Hahn, A. L. Bollinger, M. E.	2021	Parents	The parents reported that their child should avoid the food item, even if the item was safe and reported that a food allergy did not need to be avoided, when it should be avoided based on the child's food allergy.
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