

THE NATURE OF THE ASSOCIATION BETWEEN FOOD ALLERGY AND
ANXIETY IN CHILDREN AND THEIR PARENTS

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Approval of the Dissertation

This Dissertation, by Paula Andrea Garay has been approved by the committee members below, who recommend it be accepted by the University of Bridgeport, College of Health Sciences in partial fulfillment of requirements for the degree of Doctor of Health Sciences (D.H.Sc.)

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Abstract

Food allergy is an adverse reaction to the ingestion of certain food items such as nuts, eggs, and cow's milk. It affects all age groups but is particularly worrisome in children who may have severe or even fatal reactions. The incidence of food allergies is estimated to be approximately 4-6% among children up to 18 years of age in the US. The swiftness of onset of food allergies, the fact that they may be triggered by the ingestion of commonly available food substances, and the difficulty of diagnosis and selection of preventive medication often cause high levels of stress and anxiety among children and their parents or caregivers. Parents are often faced with challenges related to the food that is accessible to their children as well as with the quality of medical attention that is readily available if an allergic reaction does occur. A systematic review was performed to investigate the relative lack of information that children suffering from food allergies and their parents encounter, allowing for a broad set of recommendations to dispel some doubts, lower anxiety levels, and improve quality of life for the entire family unit. Online databases were searched to create a list of articles that investigated issues related to quality of life and association between food allergy and anxiety among children and their parents. One of the effective strategies for coping with food challenges was found to be the oral food challenge, in which patients are requested to intentionally ingest suspected allergens. During oral food challenges, patients are continuously clinically monitored for an onset of reactions, which is the protocol required to establish a definitive diagnosis of food allergy. It was also found that food allergy impacts the quality of life of caregivers, although pediatric allergist specialty care may lower the degree of this impairment to an extent through correct diagnosis and appropriate counseling.

Keywords: food allergies, anxiety, quality of life, stress, oral food challenge

I dedicate this dissertation first and foremost to my loving and supportive husband, William Garay, who has rooted for me, encouraged me, and believed in me when I needed it the most. To my beautiful children, Natalia and Leonardo Garay, who are my biggest motivation for everything I do and whose tender faces have given me the fuel I needed to push forward on the toughest days. And to my adoring stepson, William Garay, who has inspired me to better myself and strive my hardest to be a good example for him.

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THE NATURE OF THE ASSOCIATION BETWEEN FOOD ALLERGY AND ANXIETY IN CHILDREN AND THEIR PARENTS

While widely common with effective treatment options available, food allergies can be emotionally and mentally detrimental and an extremely isolating condition to those suffering from them. It deeply affects the patient themselves in addition to their immediate family as well as the individuals in their close circle of friends. Living with a food allergy influences every single thing a person does and all of the choices and decisions they make well into their geriatric years. Although allergy and immunology specialists are continuously discovering and learning new treatment options, many physicians overlook the importance of also offering their patients coping tools or the appropriate referrals to seek help to learn how to handle the stress and anxiety associated with having food allergies. This is especially important when it comes to children since their minds are easily impacted and they are still in the process of learning how to deal with emotions. Being a small child with a food allergy is frustrating, confusing, and frightening. Often times they do not know how to express these feelings and this is immensely overwhelming, painful, and discouraging for parents.

The purpose of this study is to conduct a systematic review to investigate the relative lack of information that children suffering from food allergies and their parents have to face so that a broad set of recommendations can be made to dispel some of their doubts, lower their anxiety levels, and improve their quality of life. Chapter one discusses the background of the connection between food allergies and anxiety among children and their parents. Beyond the problem of the research, this chapter further discusses the rationale and purpose of the study. More importantly, it enlists the research questions of the study. The study will conduct a comprehensive

review of the literature on incidence of food allergies of various types, their symptoms and severity, psychological and social impacts on afflicted children and their families, to provide evidence linked to quality of life issues for afflicted children, parents, and immediate caregivers.

Background of the Problem

Allergic conditions of various types are usually the most frequently identified medical symptom in populations across the world. The situation is no different in the US, where approximately 6-10% of children (up to 18 years of age) report being afflicted with food allergy while 35% of the afflicted children experience one or more serious incidents (Shaker, Schwartz, & Ferguson, 2017). Food allergy is popularly described as an abnormal reaction of the immune system of the body when food is ingested, but it often has severe, even fatal, consequences for the person involved. This is because the reaction may range from mild to severe and may include rapidly developing symptoms such as swelling and tingling of lips and tongue, rash, vomiting, and even breathing difficulty and anaphylactic shock (Birdi, Cooke, & Knibb, 2016).

In addition, Gupta et al. (2013) estimated that the total cost associated with food allergy, including visits to a physician (for milder cases), emergency admission (for severe cases), hospital care, emergency transport, medication, and the provision of special diets, may exceed \$4,000 annually per diagnosed child. The risks and consequences associated with food reactions often give rise to anxiety among children as well as in their parents and families. This is especially true as food allergy is most common among infants and very young children, who constitute a vulnerable segment of the population.

One of the issues related to the study of food allergy by pediatricians and general physicians is the use of a broad variety of terms that are used in different parts of the world when describing hypersensitivity to food and the resulting conditions, and the associated confusion that they may create. Therefore, it is prudent to define the various terms that will be used in this paper and relate them to the terminology used in literature.

Food Allergy

A food allergy is an allergic reaction to ingested food. An adverse food reaction is a generic term that is often used to signify an untoward reaction resulting from the ingestion of food. This reaction is usually classified into either a toxic or a non-toxic reaction (Ebisawa et al., 2015). A toxic reaction occurs when the child has ingested a large enough amount of the reaction-inducing food, while in contrast, a non-toxic reaction depends on the susceptibility of the individual; the latter is also often mediated by an immune agent (such as hypersensitivity or IgE mediated allergy to a specific food) or by a non-immune agent (such as intolerance to a number of food substances).

The immediate type of food allergy presents itself as a variety of symptoms and have, therefore, been further classified according to the organs they affect and the symptoms that they generate. For example, a food allergy affecting the upper respiratory tract may result in nasal congestion, laryngeal edema, and rhinorrhea, whereas a gastrointestinal food allergy may result in oral pruritus, pharyngeal pruritus, vomiting, and diarrhea (Ebisawa et al., 2015). As a result of the wide variety of food allergies, the organs affected, and the mechanism of affliction, diagnosis of the allergy, and the agent responsible may pose significant challenges to physicians. In particular, with the onset of acute symptoms in children, the treating physician

must consider several factors such as the role of environmental allergens and medicines such as antibiotics, anticonvulsants, or anti-inflammatories, that may have provoked a hypersensitivity.

Food Intolerances

Most adverse food reactions are caused by food intolerances, which may be classified as enzymatic, pharmacologic, and idiopathic intolerance. An enzymatic food intolerance is the result of deficiency of secondary lactase and is the most common form among both children and adults. It manifests itself as bloating of the face and other body parts, nausea, and diarrhea. Pharmacologic food intolerance, which is rarer, occurs when a child is highly reactive to substances found in foods such as tyramine, found in varieties of cheeses, and vasoactive amines, such as histamine and serotonin that are found in many common food items such as pineapples, bananas, and some vegetables. Those reactions for which the physiologic mechanism has not yet been confirmed are classified as idiopathic, whereas food allergies are categorized as immediate or IgE mediated and delayed or non-IgE mediated (delayed allergies are thought to be mediated by some forms of cell reactions).

Rationale for the Study

The swiftness of onset of many food allergies, the fact that they may be triggered by the ingestion of commonly available food substances, and the difficulty of diagnosis and selection of preventive medication often cause high levels of stress and anxiety among children and their parents or other caregivers. For example, Bollinger et al. (2006) found that stress levels among parents whose children have been diagnosed with some form of food allergy increases by 41%, as a result of which

the parents try to avoid social events and family gatherings in order to decrease stress within the family. In addition, Broome-Stone (2012) noted that health professionals and caregivers are often insufficiently trained and are not able to adequately address the needs of such children or their parents by providing them with accurate information on a timely basis. According to Quach & John (2018), food allergies often define the way a child leads his or her life and may pose a considerable challenge in the choice of foods that his or her parents may have in the household due to the concern for an allergic reaction. Depending on the extent of hypersensitivity exhibited, some reactions may even prove to be fatal. Such allergies often have no cure and parents of afflicted children exert considerable efforts and devote resources to create an emergency preparedness state in order to ensure the safety and well-being of their offspring. They are faced with challenges relating to the food that is accessible to their children as well as with the quality of medical attention that is made available if an allergic reaction does occur. Despite these shortcomings, it appears that adequate research has not been undertaken to investigate the quality of life as well as anxieties suffered by food-allergic children and their parents and extended families.

The rationale of this systematic review study is to investigate the relative lack of information that food-allergic children and their parents encounter, allowing a broad set of recommendations to be made to dispel their doubts and lower their anxiety levels, resulting in an improvement of their overall quality of life.

Purpose of the Study

According to Perkin et al. (2020), various types of food allergies are increasing throughout the world and at the same time there is a consensus that

diagnosis and management of food allergies are often complex tasks because of the many variables involved. While the existence of stress among children with food allergies and their parents has been established, a variety of psychological and physiological factors associated with this stress have not been documented in detail. In addition, while hospital records and studies have established that parents frequently seek medical assistance (including admission to hospitals) in such cases, there does not seem to be much research into examining the quality of life issues that food allergy afflicted children and their parents may encounter. Research in this area is desirable as the prevalence rates of anxiety disorders of various types has been shown to be higher for those with medical conditions compared to healthy conditions. Additionally, anxiety for mild conditions that, otherwise may not be medically diagnosed as a disorder, has been shown to adversely affect normal functioning and the health of children afflicted with severe or mild disorders (Friedman & Morris, 2016). Therefore, the problem that this research will explore is the association between the occurrence of food allergy in children and the anxiety experienced by such children, their parents, and immediate families, regarding psychosocial conditions, parental burden, and parental risk perception. The research will also examine the relationship between anxiety, stress, depression, and other such quality of life issues in families struggling with food allergy conditions.

Research Questions

The following are the research questions that were considered in this systematic review study:

1. What is the nature of the association between food-related allergy and anxiety in children and their parents?

2. What are the underlying factors that affect this association?
3. What are quality of life issues that parents have to face?
4. What is the relationship between quality of life and factors such as stress, anxiety, and depression?

The remainder of the research was completed with a search of the literature to discover the association between food allergy and stress in children and their parents as well as quality of life issues arising as a result, an explanation of how the review was performed, a discussion of the findings from the literature review, and recommendations for nurses and practitioners how to handle cases of food allergy in children to improve quality of life of those affected.

Review of the Literature

A review of the literature was performed to assess the state of knowledge concerning the following topics: incidence of food allergies of various types, their symptoms and severity, psychological and social impacts on afflicted children and their families, nature of the anxieties faced by afflicted children and their families, and quality of life issues for afflicted children, parents, and immediate caregivers.

Food Allergy Incidence

According to Longo et al. (2013), food allergy leads to dietary habits and social interaction changes in children and families throughout the world. While most children are diagnosed with immunoglobulin E (IgE) mediated allergies, some are afflicted with non-IgE cell-mediated allergy that presents with a variety of gastrointestinal symptoms. IgE-mediated food allergies are a result of an abnormal immune system reaction. When exposed to one or various allergic foods, people with this type of allergy will quickly react. Some reactions develop within a few minutes and others manifest within a few hours. Milk and eggs are the most common allergens, while peanut constitutes the third most common allergen in the US, accounting for approximately 21% of the cases. The other members of The Big Eight food allergen group include fish, shellfish, tree nuts, wheat, and soy. The authors noted that children with a family history of food allergy are more at risk of being diagnosed with the syndrome. Hence, the new recommendation to administer food testing on babies as young as four months old who have food allergic siblings. The reported resolution rates (or probabilities that children will outgrow a specific food allergy) for allergy to cow's milk, according to the authors, is 45-50% at one year, increasing to 60-75% at age two years, and to 85-90% at age three years. Similarly,

approximately 50% of children outgrow soy allergy by the time they are seven years old and 65% outgrow allergy to wheat by 12 years of age. However, the authors noted that children with high levels of egg IgE are unlikely to become tolerant to eggs, while allergy to peanuts and tree nuts is most often associated with fatal anaphylaxis episodes. Only about 20% of children with peanut allergy develop tolerance to the food, which in addition has a recurrence rate of 8%.

Another common food allergy in the US affecting approximately six million children is sesame seed allergy. Sesame allergy has a high risk of causing severe reactions, is infrequently outgrown, and is rapidly accelerating due to the increased use of sesame seed and its oil in many food ingredients in the nation. A survey carried out by Pistiner, Hernandez-Trujillo, & Davis (2018) noted that one of the primary reasons for this increase in sesame allergy is that it is not at present recognized as an allergen in the US and is, therefore, exempt from the Food Allergen Labeling and Consumer Protection Act (FALCPA). The FALCPA at present applies to only eight of the common allergens and provides guidelines for clear and understandable labeling for food products containing these substances. However, since sesame is not included in its list, parents are often not able to make informed decisions while purchasing or preparing food and serving it to their children.

Tracing the history and incidence of food allergy in the US, Savage & Johns (2015) noted that IgE mediated allergy is showing a clear upward trend over recent times (especially since the 1980s), but the exact cause or mechanism of this increase is not yet identified. The authors discussed several lacunae in incidence estimation, including the facts that most estimates are derived from self-reportage (or reported by parents), there is often very low awareness of symptoms among children and parents despite increasing media coverage, and a recent nationally representative population

based survey (the National Health and Nutrition Examination Survey or NHANES) being mostly internet-based and, therefore, having a high probability of selection bias. They observed that this is perhaps one of the reasons that estimates of incidence of childhood food allergy among the general population varies considerably, from 1-2% to 10%. The authors also identified several risk factors for food allergy among children and adolescents, including a family history of atopy (an increase in risk by 40% for one immediate family member with allergy and by 80% for two immediate for two such members), race/ethnicity (non-Hispanic African Americans and Asians are more at risk), and gender (male children). They observed that mutations in the filament aggregating protein or Filaggrin gene have been associated with egg, milk, and wheat allergy, but the mechanism of activation is not yet clear.

Dunlop & Keet (2018), while noting that self-reported food allergy rates among children in the US vary between 4.8% and 8%, observed that there are several difficulties in creating an accurate estimate because large scale epidemiology studies on this subject are rare to come across and difficult to undertake. According to the authors, parents often mistake other symptoms and conditions (such as lactose intolerance) for food allergy and surveys do not ask questions that do not distinguish between IgE-mediated allergy, non-IgE-mediated allergy and intolerance, which leads to an overestimation of food allergy incidences among children. On the other hand, more specific and clearly focused surveys have been conducted through telephone or online, but these suffer from selection bias and this again increases overall incidence reports by as much as 20%. Dunlop & Keet (2018) also noted that non-Hispanic African American children are more likely to be sensitized to food compared to non-Hispanic White children, but it is as yet unclear as to whether these differences in sensitization are accompanied with differences in cases of food allergy.

Allergic sensitization is explained as the initial onset of an allergic immunologic response when an individual is exposed to a specific allergen.

Based on a survey of the literature, it has been discovered that the exact incidence of food allergy among children in the US is unclear, although a broad range appears to be between 4% and 6%. Alarming, this incidence is showing a clear trend despite increased awareness and discussion in the media. The reasons for this are currently nebulous. A small part of this escalated trend may be attributed to increased reporting or that parents may be confusing food allergy with other symptoms related to food intolerance, but there is a need to investigate in greater detail the underlying mechanisms of increased food allergy incidence.

Symptoms and Severity

According to Motoshue et al. (2018), anaphylactic reactions in children, as observed in emergency departments across the nation, are most often caused by food allergies and food-induced anaphylaxis (FIA), which is an IgE mediated reaction to ingested food with potentially fatal consequences. It accounts for approximately 30-50% of anaphylactic cases in the US and other developed nations. More alarmingly, incidence of FIA among children increased by almost 50% over the period 1997-2011 with almost 10,000 children being hospitalized because of food allergy-related symptoms between 2004 and 2006 (which was a three-fold increase over hospitalization cases in 1998). The authors performed a longitudinal survey of secondary data for children below 18 years of age and found that cow's milk accounted for most of the cases, followed by eggs, peanuts, tree nuts and seeds, crustaceans, fish, and other types of food (including fruits and vegetables). There were 7,310 emergency department visits over a 10-year period (2005-2014) and the

rate of visits (from among all cases of hospitalization) increased by 214% during this period. Infants, ages zero to two years, accounted for the most number of visits, followed by children ages three to six years. The authors noticed a significant rising trend in FIA related emergency admissions over the ten-year period and suggested that this may be because of higher prevalence of food allergy as well as increased awareness of FIA and associated symptoms and lower threshold among parents for seeking emergency care for their children. Interestingly, the authors also reported that inpatient and ICU admissions related to food allergy decreased over the same period, which may indicate that immediate emergency assistance, evolving treatment methods, and better levels of care may be helping children recover more quickly and effectively from food allergy-related reactions.

Quality of Life Issues for Afflicted Children, Parents, and Immediate Caregivers

The effects that food allergies have on children and their families, in terms of daily challenges and overall quality of life issues, have been extensively studied. Before evaluating these studies, however, it will be useful to define a set of objective criteria that have often been used to measure the quality of life of food-allergic children. Some of the earlier quality of life measurement scales for children were reviewed by Eiser & Morse (2001) with the purpose of better healthcare service delivery in cases where a disease could not be cured but could be managed. Such a scale is devised after considering several aspects, such as: it should be a multidimensional construct across several domains of the human experience; it should account for the fact that individual quality of life experiences encompasses several domains such as lifestyle, experiences, hope of future life, expectations, and ambitions, and it should capture not only an absence of disease but also the perception

of an individual with respect to her stage of life and the value systems of her society and community. Based on these criteria, the authors evaluated several quality of life questionnaires and scales for children. For example, a scale developed by Mishoe et al. (1998) for use among children with asthma was found to have satisfactory reliability and validity.

Overall quality of life for an entire family is altered due to simply having one member with food allergies. Often, when one child suffers from a food allergy, the whole family is limited and prohibited from consuming such food to avoid accidental ingestion. This is often the case in households with small children as they are less aware of potential cross-contamination than older children, teenagers, and adults. If a child is allergic to peanuts, their siblings most likely will also be prohibited from eating peanuts because of parents' fear, anxiety, and paranoia connected to the one allergic child. Other times this may also strengthen a family and unite them as they view this limitation as an opportunity to show support. The allergic child may feel less lonely or isolated since the entire family is also avoiding the foods that have the potential to cause a life-threatening allergic reaction.

Dunn Galvin et al. (2008) developed a scale for specifically measuring quality of life for children afflicted with food allergy using a questionnaire for children aged 0–12 years as shown in figure 1 below. It had three subscales – emotional impact, food anxiety, and social and dietary limitations – and had good psychometric properties, such as high internal consistency, discriminant validity, and construct validity. According to the authors, the instrument may be used to accurately measure the impact on emotional functioning and social restrictions imposed by food allergy among children of different age groups. As observed by the authors, “the results suggest that the anxiety associated with the risk of a potential reaction has more

profound effects on the emotional and social aspects of a child’s everyday life than clinical reactivity induced by food intake” (Dunn Galvin et al., 2008, p. 985).

Figure 1

FAQLQ-PF	Baseline positive (SD)	2 months positive (SD)	6 months positive (SD)	Change positive (effect size) [†] <i>P</i> <0.05	Baseline negative (SD)	2 months negative (SD)	6 months negative (SD)	Change negative (effect size) [†] <i>P</i> <0.05	SEM*
Overall	4.1 (1.4)	3.6 (1.4)	2.9(1.5)	1.2 (0.45)	3.9 (1.5)	3.2(1.5)	1.6(1.5)	2.3 (0.87)	0.45
EI	4.2 (1.3)	3.3(1.3)	2.5(1.2)	1.7	4.0 (1.5)	3.4(1.4)	1.8(1.3)	2.2	0.5
FA	4.1 (1.4)	3.7(1.6)	3.2(1.6)	0.9	3.9 (1.3)	3.0(1.4)	1.5(1.3)	2.6	0.5
SDL	4.0 (1.6)	3.6 (1.2)	3.0 (1.3)	1.0.	4.0 (1.3)	3.0 (1.2)	1.3 (1.2)	2.7	0.4

Note: FAQLQ-PF (Total Score and Subscales). Reprinted from “Food allergy QoL questionnaire for children aged 0–12 years: Content, construct, and cross-cultural validity” by A. Dunn Galvin, 2008, *Clinical & Experimental Allergy*, 38(6), 983.

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Using the instrument, the authors found that peanut allergic children have lower quality of life scores than children suffering from other types of food allergies or even multiple food allergies, possibly because it is more difficult to avoid peanuts than other types of foods. This is attributed to the fact that peanuts are found in a plethora of candy, cookies, ice creams, and other sweets and there is a higher chance for contamination. The instrument was also used by Flokstra-de Blok et al. (2010) to evaluate health-related quality of life for children, adolescents, and adults with food allergies of various types. They measured the physical, emotional, and behavioral wellbeing of the participants and found that afflicted children had overall lower quality of life than children without food allergies, although they did not report any

significant limitations in schoolwork or behavior with friends because of behavioral problems. They suggested that this could be because children with food allergies are more conscious of their behavior and food choices and they try to be less impulsive, which results in lower incidences of behavioral problems than children without such afflictions. The authors also observed that even though food allergies have the same overall incidence rates as some other diseases such as diabetes, public awareness about the former is much lower and this again leads to lower quality of life metrics for the affected.

A similar comparison between health-related quality of life parameters between food-allergic children, adolescents, and adults was conducted by van der Velde et al. (2012). The authors used a double-blind placebo-controlled design to evaluate both longitudinal validity and responsiveness of the measures and found a significant decrease in quality of life after a negative incident. A broader study performed by Wassenberg et al. (2012) using a similar instrument indicated that lower quality of life scores were achieved by older children, those with more severe reactions to food, and those who had additional close relatives with food allergy in the family. They observed that the diagnosis of one or more children in the family being allergic to one or more food ingredient creates a state of fear and anxiety that changes the behavior of the entire family in day-to-day life as well as on special occasions such as family gatherings and community events. In addition, they found a significant difference in perceptions between young children and school-going children – the latter reported a lower quality of life in general and particularly if they also had a younger sibling diagnosed with some form of a food allergy. The older children were found to have a lower quality of life than the younger children both with respect to the self-reported scores of the latter and the perceptions of their parents, indicating that

quality of life deteriorates as children afflicted with food allergies grow up. The authors also reported that children with a food allergic mother had lower quality of life, but this was probably because they were influenced to a great extent by the experiences and outlook of their mothers. Interestingly, girls were found to have a greater impact on their quality of life than boys and this difference in gendered experience was in line with the findings of several other authors as reported in this study.

Greenhawt (2016) evaluated the reliability and validity of instruments that measure food allergy-related quality of life for afflicted children and their parents. He noted that generic quality of life measurements, that are often used for other chronic illnesses, are a poor choice for food allergy cases because the experiences of food-allergic children and their parents are often very different. Also, there seems to be a much wider variation in experiences and factors related to the reaction history of individuals and their families, including specific social and cultural factors associated with food, so that instruments do not have a high generalizability. Additionally, Greenhawt (2016) held that the quality of life index of the food allergic child and his or her caregiver could often differ considerably based on individual life stages and experiences. The authors established several reliability criteria, such as a required Cronbach's alpha value above 0.7 for single administration instruments and interclass correlation coefficient value is above 0.7 for multiple administration instruments. They also established validity criteria such as criterion validity (Pearson coefficient above 0.3) and discriminant validity (desired coefficient below 0.3) to measure the association of the designed instrument with an existing instrument and its difference with an instrument that measures a different construct, respectively. Based on these criteria, they evaluated several of the quality of life scales discussed earlier in this

review. For example, evaluating the health-related quality of life questionnaire by DunnGavin et al. (2008), Greenhawt (2016) observed that it has a high value of Cronbach's alpha and high Pearson's correlation coefficients for criterion and convergent validities. Another instrument, the Food Allergy Quality of Life Questionnaires (FAQLQ), which is more commonly used in Europe, was also found to have high single and multiple administration reliabilities and good face, criterion, convergent, and discriminant validities. Therefore, according to Greenhawt (2016), these instruments may be used to measure the quality of life for food-allergic children.

The review on quality of life instruments indicates that a number of these have been devised to measure different aspects of the patient experience such as lifestyle, experiences, hope of future life, expectations, ambitions, and other parameters. These measurements are usually specific to the culture and ethnic group of the patient and are, therefore, often limited to different nations. Such instruments have also been devised to measure the quality of life of children afflicted with food allergies as well as their parents or immediate caregivers. The measurement instruments are expected to have several psychometric characteristics related to reliability and validity, such as high internal consistency, face validity, construct validity, discriminant reliability, and criterion reliability. Based on these characteristics, a few instruments such as the General Health Quality of Life survey (GHQL) and the FAQLQ have been evaluated by several authors across different age groups (i.e. children, adolescents, and adults) and have been found to be satisfactory. Consequently, the instruments have been used by other authors to measure the quality of life of food allergy afflicted children and they have drawn solid conclusions that will be discussed in greater detail in a later section.

Psychological and Social Impacts on Afflicted Children and their Families

According to Leo & Clark (2007), an increase in IgE mediated food allergies among children has resulted in an increased awareness of the various psychological and social problems that such children face, while at the same time there has been an increased awareness about the understanding and management of the disease. Over one-third of children have a food allergy-related incident in an accidental manner prior to the awareness of the existence of the condition and this may pose a significant challenge for the child, the parents, teachers, and medical personnel who are often first responders in such situations. The authors also noted that the diagnosis can be an overwhelming experience for the child and family and they may face several issues while coping with the reaction and diagnosis, that should be addressed by health care service providers and support personnel. Describing the childcare and school settings of afflicted children, the authors noted that school administrators are often called upon to work with the parents to provide medical, academic, and social support systems to help the children cope with the psychological stresses induced by food allergies.

Broome-Stone (2012) observed that having a food allergic child in the family is akin to having a chronic illness, although food-induced anaphylaxis is not recognized as a chronic condition, and it creates a physical impairment that may impose considerable constraints on one or more life activities of the child (such as eating, breathing, and attending school). Thus, food allergy is recognized as a disability as defined by the Americans with Disabilities Act. This ADA designation also requires parents to collaborate with school administrators so that the latter

understand the constraints imposed upon afflicted children and create solutions that minimize absence from school and potential impact on academics. Coping with their children's illnesses often results in high levels of stress for parents, which in turn affect their parenting abilities and their own sense of well-being. Such responses to chronic illnesses are, in fact, discussed widely in pediatric nursing literature and the impact of the resulting stresses, coping strategies used, and ways of adapting to the conditions are similar to the experiences of children with food allergy and their parents (Hockenberry & Wilson 2009).

Taking a similar approach, Birdi, Cooke, & Knibb (2016) argued that food allergy affliction causes similar stress levels among children and their parents as any other chronic illness would and requires similar approaches from physicians, nurses, and counselors. They performed a cross sectional quantitative study to investigate issues such as anxiety, stress, depression, and parental quality of life when at least one child was diagnosed with food allergy. They found that diagnosis of food allergy in a child is significantly associated with poor mental health of their parents over longer periods, irrespective of whether the parent or someone else in the family possesses such allergy. Parents in such cases were also found to be suffering from high levels of stress, anxiety, and depression because they often found the burden of constantly caring for their food allergic child to be overwhelming. An interesting observation by the authors was that parents whose children were diagnosed clinically to have food allergy had lower levels of anxiety than parents who diagnosed the condition themselves. It is speculated that the latter had higher levels of uncertainty or did not have access to healthcare providers who were properly trained to handle such diagnoses. Providing appropriate and timely information to parents, therefore, was found to be an effective way of reducing stress levels in the family. The authors also

observed a significant difference in quality of life between parents of children diagnosed with a food allergy clinically and parents who made the diagnosis themselves – the latter often had less information and a less robust support system, which made them more anxious and less satisfied. The authors conjectured that parents whose children were medically diagnosed were more likely to be better educated, have higher socioeconomic status, and be better informed in general and, therefore, be less anxious and have better quality of life. Interestingly, Birdi, Cooke, & Knibb (2016) found that, in terms of quality of life, parents of children having food allergy were no different than parents of children without this diagnosis and this was in line with earlier research conducted by King, Knibb, & Hourihane (2009).

Valentine & Knibb (2011) compared quality of life issues for families of children diagnosed with severe food allergies with those for families of children diagnosed with mild food allergies or no allergy at all. The authors defined quality of life in terms of several objective and subjective criteria that together influence the idea of well-being in an individual, criteria which are moreover linked to cultural and temporal aspects of life. They used some of the quality of life criteria developed by Dunn Galvin et al. (2008) but extended these to the immediate family of the child (where most of the criteria developed by other authors only described quality of life for the children themselves). According to Valentine & Knibb (2011), quality of life of afflicted families is influenced by several factors, such as the necessity to always remain cautious about the food being consumed, the necessity of social restrictions and food not being shared with others, difficulties and disruptions during family and social gatherings, and parental emotional distress.

Anxiety, Stress, and Mental Health of Mothers of Affected Children

Quality of life issues for affected children and their mothers were also investigated by Cummings et al. (2010), who found that anxiety levels among the latter were lower when their children were prescribed with an epinephrine auto-injector. The authors also noted that children with peanut allergy are usually given a management plan and physicians advise a prompt intramuscular injection of epinephrine when an anaphylaxis reaction occurs. Parents are educated in the matter of the management plan and the injection because a reaction may prove fatal if not immediately treated. It was found that better clinical management of the allergy reduces anxiety levels among children and their mothers, while actual adherence of children to their prescribed interventions did not significantly affect anxiety, stress levels, and quality of life indicators. Children diagnosed with allergy were found to have lower social and emotional aspects of quality of life while their mothers had higher trait levels of anxiety. The authors reported that mothers who had access to specialist pediatric care units or trained nurses had equal or lower levels of anxiety compared to mothers whose children were not afflicted, and this finding was in line with observations made by Birdi, Cooke, & Knibb (2016). Cummings et al. (2010) also found that high levels of anxiety in mothers were not associated with better adherence to the prescribed allergy avoidance program but with information anxiety, while on the other hand, low levels of anxiety were associated with the availability of information and vigilance. As a result, often the knowledge that an auto-injector had been prescribed contributed to a lower level of anxiety than whether the child was carrying it and always had it available to them. Also, if a food label contained information about a particular allergic substance contributed to a lower level of anxiety than whether the child could accidentally consume the food. The authors also found that a few demographic variables were associated with quality of life issues –

for example, older children and parents were more likely to have lower levels of anxiety (perhaps because they had become more accustomed to living with the condition) while girls were more likely to be more anxious about the physical aspects of the affliction compared to boys. On the other hand, factors such as the severity of previous incidents, dose of medication prescribed, and previous hospital admission records were not found to have any significant influence on quality of life.

One of the aspects of the social impacts of food allergies on children is the manner in which the condition affects the mother of the child, given that the condition may be diagnosed as life-threatening in some cases. Rouf, White, & Evans (2012) investigated the maternal experience in such cases and observed that parents, especially mothers, are most often tasked with ensuring that children with a diagnosis of anaphylaxis avoid the allergen and communicating the risk to others with whom the children interact. They also found that parents tried to adjust to the diagnosis of their child through a variety of emotional responses that include trauma, grief, anxiety, and hope. Mothers of such children suggested that witnessing the allergic reactions could have a lasting impact and potentially influenced the response to future, even minor, reactions. They also experienced loss and grief following their child's diagnosis both in relation to things that they would not be able to do with their child and limitations on the child themselves. The authors noted that fear and anxiety seemed to be common reactions among parents of afflicted children and reported some participants saying that they felt more relaxed when they were with their other (non-allergic) children. Contemplating the future was also found to be a concern, particularly in adolescence, though parents recognized the need to regulate their anxiety. In broad terms, the authors reported that there was a sense among mothers that they needed to adjust and find equilibrium over time, after the initial shock of

witnessing the child's allergic reaction. Mothers also experienced several emotional impacts following their child's first allergic reaction and diagnosis. While trauma symptoms were not highlighted in parents of children with food allergy, the authors found some evidence that parents clearly became traumatized when they witnessed their child having very severe allergic reactions. Mothers were expected to be responsible for the welfare of their children and their being able to successfully avoid food substances, which was described as a burden. It reportedly left them feeling exhausted and with a feeling of loss of control over events. The authors reported that food allergy diagnosis posed potential challenges to the identity of both mother and child, whereby mothers emphasized the challenge of maintaining an inclusive, "normal" life and not being defined or excluded from events or experiences by the allergy. Normalizing was found to be a common strategy used in other childhood chronic illness, often resulting in a "thriving management style" in which parents create a secure, nurturing environment for their child, keeping the illness in the background. Similar findings were also reported earlier by Knafl et al. (1996) while investigating the responses of the family to childhood chronic illnesses in general.

Methods

A quantitative methodology was adopted for this research paper because some of the aspects of quality of life issues associated with food allergies in children have not been investigated fully. An exploratory and inductive approach was found to be appropriate to have an in-depth look at the issues involved. Several quantitative methodologies have been developed for research purposes and these include gathering data through semi-structured interviews and focus group discussions, ethnographic and case studies, and systematic review of the literature.

For the current study, a comprehensive review of the literature on incidence of food allergies of various types, their symptoms and severity, psychological and social impacts on afflicted children and their families was conducted, to provide evidence linked to quality of life issues for afflicted children, parents, and immediate caregivers.

Procedures

Search Procedure

A careful review of the literature related to types of food allergies, their severity and symptoms as well as their social and psychological impacts on afflicted children and their families was explored. The review highlighted the following topics: (a) food allergy incidence, (b) symptoms and severity, (c) quality of life issues for afflicted children, parents, and immediate caregivers, (d) psychological and social impacts on afflicted children and their families, and (e) anxiety, stress, and mental health of mothers of affected children.

Libraries Included

There were two libraries used for the search of the sources for this project. The University of Central Florida library and the Free Library of Philadelphia.

Search Engines and Databases Utilized

The following databases were used to search for the sources for this project. Electronic databases included articles from Medline, Scopus, Pubmed, EBSCOhost, Science Direct Journal, BMJ Open Access and free journals, Ovid, and Citations and Abstracts for Literature of Nursing and Allied Health (CINAHL). Google Scholar was also utilized as a resource to identify pertinent articles and references to obtain current published literature on simulation-based education.

Search Terms

Several search terms were used to identify relevant source for the research paper. The search terms included (a) food allergies, (b) symptoms and severity of food allergies, (c) quality of life of afflicted children, (d) impacts of food allergies on afflicted children, (e) anxiety and stress related to food allergies among other search terms.

Boolean Strings

Boolean strings were considered for this literature search. Boolean strings used: food allergies AND symptoms, food allergies AND quality of life, psychological and social impacts AND food allergies AND afflicted children, anxiety, stress AND food allergies, food AND intolerance, food allergies AND mental health of mothers of affected children, food intolerance AND quality of life of afflicted children.

Age of the Sources

Significant literature was reviewed. Sources from the last 5 years were considered for inclusion in the review of the literature. Pertinent historical or seminal articles were also considered for historical purposes.

Inclusion Criteria

There were four inclusion criteria. Inclusion criteria included (a) literature published since 2015, except seminal sources; (b) English-language text; (c) website relating to healthcare simulation technology; and (d) peer-reviewed articles.

Exclusion Criteria

There were four exclusion criteria. The exclusion criteria included (a) literature published before 2015, except historical sources; (b) text not published in English; (c) articles not peer-reviewed; and (d) websites not relating to simulation technology and education in health sciences and medicine.

Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols

One of the methods that is often used for this purpose is Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P), which is essentially an iterative process for finding and evaluating relevant articles based on their scope and quality. Although the PRISMA framework was initially developed for randomized trials, it was later expanded to include other types of peer-reviewed studies. According to Moher et al. (2009), who were part of the group which developed the protocol, “A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies. Meta-analysis refers to the use of statistical techniques in a systematic review to integrate the results of the included studies.” (p. 2)

The protocol has subsequently been used on several occasions, in particular for conducting meta-analysis and reviews of articles in the medical field, as seen in

Malczak et al. (2017) and Dos Santos et al. (2019). For this research, online databases were searched initially to create a list of articles relevant to the research topic, which is quality of life issues and association between food allergy and anxiety in children and their parents. Some of the databases searched for this purpose included Pubmed, Ovid-Medline, PsycINFO, and CENTRAL. Google Scholar was also used to locate research articles.

Stages and Overview of PRISMA

A brief overview of the PRISMA protocol may be provided here. It consists of four stages: identification, screening, eligibility, and included. The first stage of identification consists of two activities: number of records identified through database searching, and the number of records identified through other sources. These lead to the second stage of screening, which consists of three activities: number of records after duplicates removed, number of records screened, and number of records excluded. Completion of these three activities leads to the eligibility stage, which consists of the activities of identifying the number of full-text articles assessed for eligibility and the number of full-text articles excluded, with reasons. These lead to the fourth and final stage, where the number of studies included in the qualitative analysis is finalized and a meta-analysis of the articles is performed (Moher et al. 2009, p. 5).

The first stage of selection, according to the above outlined protocol, was identification: records identified through database searching and through other sources. For this purpose, appropriate inclusion and exclusion criteria were used. For example, the first inclusion criterion was that papers published between 2005 and 2020 were used to include research over the last 15 years but not to include anything that provided dated information. Another inclusion criterion was papers that had one

or more appropriate MeSH terms as defined in Medical Subject Headings and U.S. National Library of Medicine: food allergy, nut allergy, IgE mediated and non-IgE mediated, quality of life, food allergy for children, and others. Various combinations of these terms were used in the databases through appropriate Boolean operators such as AND, OR, string search with quotation marks, and search in author fields. The search terms contained the population of interest (children and their close relatives or family members such as parents and other close caregivers), the health topic (food allergies, both IgE mediated and non-IgE mediated), and facets of patient-centered health care (including quality of care issues, engagement, and stress of parents and close caregivers). Some of the exclusion criteria used were: food allergies for adults, allergies of other types, and papers that discussed only clinical aspects of food allergy (without any reference to the quality of life aspect). The systematic search was supplemented with a scoping gray literature search using Google search engine with various combinations of search terms, as well as a search of dissertation abstracts and abstracts from various national and international conferences for which this topic was relevant. This resulted in an initial identification of $n = 354$ papers.

The second stage of the systematic review process, as identified in the PRISMA protocol, was screening – this consisted of removal of duplicate records and further screening of articles that were closely related to the research topic. In particular, papers were excluded for one or more of the following reasons: only the abstract was published in the English language while the paper itself was in a foreign language; it was a review, policy brief, commentary, or opinion paper (any other type of study design was accepted). The populations/samples were drawn from youth currently or formerly in foster care/state's custody or guardianship, parents and caregivers, or people providing direct services to the youth, and the aims of the study

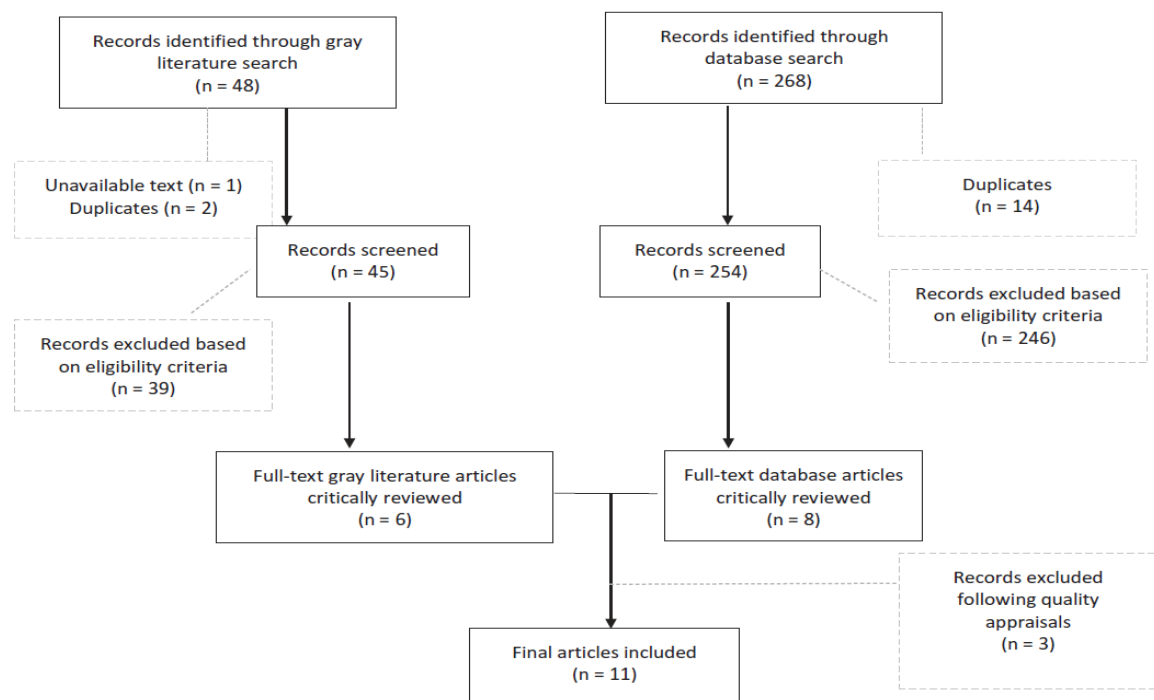
did not align with the aims of this review. After meeting these initial criteria, studies were excluded if the quality appraisal rating applied to the study did not demonstrate sufficient research quality. After meeting these initial criteria, studies were excluded if the quality appraisal rating applied to the study did not demonstrate sufficient research quality. The selected papers were reviewed by the researcher and the overall value of each paper was applied utilizing the CASP (rating of 0–10) or CEBM (rating of 0–12) quality appraisal checklists. In this case, CASP refers to Critical Appraisal Skills Program where the CASP rating was used for qualitative papers and was based on the sum of a 10-item checklist (0–10). Similarly, CEBM refers to Center for Evidence Based Medicine and the CEBM rating was used for observational survey studies and is based on the sum of a 12-item checklist (0–12). The ratings were not mutually exclusive because some studies captured more than one perspective (Wallace et al., 2017). Papers that received ratings less than 6 in CASP and less than 7 in the CEBM scale were rejected during the second stage.

At the end of the screening stage, all identified and selected papers were imported into a reference management software for the third stage (eligibility). The researcher read the abstracts of these papers to have a preliminary idea regarding the research conducted and selected $n = 11$ papers as being most related to the research subject, which is quality of life issues for children suffering from food allergy and their parents or caregivers. These papers were included for final critical review in the fourth stage of the selection process. Appropriate variables were then extracted from the papers and these included the type of publication (whether it is a peer reviewed journal and whether the journal publishes an impact factor or a similar metric), year of publication, name and affiliation of authors, how many times the paper was cited by other authors, methodology followed, and primary outcomes of the research.

Additional variables that were extracted included the demographic and other characteristics of the sample (or the population of interest), type of intervention, whether a comparison group was used or not, whether a measurement instrument was used or not, and what were the recommendations (if any). Most of the studies were qualitative, as expected, and a textual narrative synthesis technique was used to extract information from these articles. The selection stages and number of articles selected/rejected at each stage are shown in Figure 2 below.

Figure 2

Selection of papers for critical review following the PRISMA methodology



The results of the review are discussed in the following section.

Results

After meeting the inclusion criteria, studies with the appraisal rating that demonstrated sufficient research quality were selected for the systematic review process. During the review phase, the general quality of the journals was carefully examined and reflected upon. Post examination, it was possible to assign each individual paper appropriate CEBM (rating 0 – 12) or CASP (rating 0 – 10) quality appraisal scores. CASP and CEBM ratings were not mutually exclusive because some studies captured more than one perspective (Wallace et al., 2017). The journals included for the critical review stage were studied and information extracted from them is discussed below. Papers that received ratings less than 6 in CASP and less than 7 in the CEBM scale were rejected during the second stage.

Association Between Quality of Life and Other Factors

One of the themes that occurred frequently during the critical review was an association between QoL and factors such as stress and anxiety among affected children and their parents. It was also discovered that very close caregivers such as babysitters, grandparents, and daycare workers are also affected by the food allergy of the child in the form of stress and anxiety. This group of people are responsible for the daily care and well-being of the aforementioned child and having to care for someone with a chronic health issue can create constant worry and despair.

For example, Birdi, Cooke, Knibb (2016) explored the association between QoL, stress, anxiety, and depression among parents of children who have food allergy and compare these with QoL and other parameters of parents of children without food allergy. They used a study population of parents who have at least one child up to 11 years of age and they divided the parents into two groups. One group consisted of parents that had at least one child diagnosed with food allergy and the other group

contained parents that had no children with food allergy. The research methodology consisted of a quantitative cross-sectional approach which measured QoL using two sub-scales: Perceived Stress Scale (PSS) and Hospital Anxiety and Depression Scale (HADS). The primary outcome of the study was the observation that food allergy diagnosis in children leads to poorer mental health of their parents compared to parents whose children do not have food allergy. Parents of children with food allergy also have higher stress, anxiety, and uncertainty which contribute to poorer QoL. Children with food allergy have poorer mental health due to higher uncertainty and the perpetual fear of accidentally ingesting their potentially life-threatening allergen. Often, the children's poor mental health goes unnoticed and untreated, thus worsening their state of mind. A rating of 8 was assigned to the journal using the CASP and CEBM scales are discussed earlier.

Continuing with this theme, Flokstra-de Blok et al. (2010) compared health-related QoL for children with food allergies and sought to find out any changes and differences in such QoL between children, adolescents, and adults. The primary outcome of the study was the observation that patients with food allergy from each of the three age categories reported QoL that was lower than the corresponding QoLs of the general population (some exceptions were found). In particular, children with food allergy reported better QoL than adolescents when the latter had asthma, other respiratory diseases, or diabetes mellitus type 1. The lowest scores were reported by children afflicted with juvenile chronic arthritis. Based on this data, as children age, it is expected that their self-reported QoL will decrease and by adolescence, it will be the lowest in their lifetime. When these children become teenagers their self-perception heightens and they become more aware of their limitations and the impact these limitations have on their lives. They also begin to compare their lives with that

of their peers and some individuals notice where their lives are lacking. As these teenagers enter adulthood, QoL increases as they adapt to living with food allergy limitations and understand how to compensate. A rating of 7 was assigned to the journal.

Another researcher that focused his study on psychosocial differences in regards to food allergies is Reier Nilsen (2019). He investigated the causes of differences in QoL values reported by children with peanut allergy and those values reported by their parents. This study also assessed the effectiveness of an intervention in the form of oral immunotherapy and whether this intervention was able to increase child-reported QoL. The instrument used by the author to measure QoL was Pediatric Quality of Life Inventory Version 4.0 and this was applied at three different stages. First, at baseline which was at the beginning of the study, then, after one year, and finally, two years of intervention. The primary outcomes consisted of the observations that QoL significantly improved for children with a peanut allergy who underwent the treatment of oral immunotherapy over a course of two years. The QoL scores reported by parents improved to an even greater extent, indicating that parents may have overestimated the effect of the intervention in their children. The finding that parental proxy-reported, but not child self-reported QoL, improved significantly with two years of OIT, was a novel one. This is believed to be true because parents feel more confident about accidental ingestion of peanuts after undergoing oral immunotherapy since the treatment raises the allergen reaction threshold. This may not have a big enough impact on the children themselves as they may not truly understand how the threshold affects their particular condition. In fact, going through oral immunotherapy sometimes is a negative experience in children since they become sick and uncomfortable while going through the therapy. Many of them remember the

gastrointestinal issues which are a common side effect of all oral immunotherapy. A rating of 9 was assigned to the journal

Other health conditions also play a huge role on the association of allergies and lower QoL. According to Meyer et al. (2017), who observed the early impact of non-IgE mediated gastrointestinal food allergies on the QoL of families who may have to wait several months for a clinical diagnosis, average QoL scores were lower than children with intestinal failure and those with sickle cell disease. Children and parents are affected in daily activities as well as physical and emotional functioning. In addition, the parents report significant worry about their child. QoL also decreases as food choices become more limited. Some of the significant factors that impact QoL are age, severity of symptoms, number of food items eliminated from diet, and nasal congestion. Additionally, limited food choices lead to poorer nutrition in the children who did not follow the recommendations of a registered dietitian. This may be due to an inability to afford the extra service on the parents' part or, depending on the child's age, the child simply refusing to eat the food offered to them. A rating of 8 was assigned to the journal.

Much focus is placed on an actual diagnosis, however, there may not be much of a difference between people who have had a formal diagnosis versus the perceived notion of the existence of an allergy. Venter et al. (2015) found out the health-related QoL among children who have been medically diagnosed to be afflicted with some form of food hypersensitivity and compared their results with QoL among children who suspect that they have some form of food hypersensitivity. The research methods consisted of a prospective cohort design with follow-up at 10 years. They found that lower education levels of mothers are associated with poorer QoL for the children, and a history of food allergies or adverse incidents was found to be another significant

predicting factor for low QoL. Intensity of the reaction and its frequency also leads to lower QoL for both groups of children. The authors also found that QoL is not significantly affected by whether a type of food allergy has been clinically diagnosed or only suspected through adverse reactions. The negative experiences connected to a specific food that causes a child to feel sick are enough to create anxiety and stress, therefore lowering the QoL in the children and their parents. A rating of 9 was assigned to the journal.

Impact of Food Allergy on Children and Parents

Another distinct theme to emerge from the review was the impact of food allergy on the psychological and social behavior and wellbeing on the afflicted children and their parents.

For example, Broome-Stone (2012) sought to understand the psychosocial impact that the upbringing of a child with a food allergy has on the parent and also the coping strategies used and the adaptive responses among parents. The author found that parents who have a child with a chronic illness, such as a food allergy, live under a state of perpetual uncertainty because of the possibility of a sudden anaphylactic reaction. Such an ambiguous situation related to the disease can cause confusion and disorganization within the family system, and as a result, parents of children with a food allergy sometimes use problem-focused strategies to change or manage a stressful situation. According to Broome-Stone (2012), they devise several stages such as defining the problem, seeking potential solutions and learning new skills to handle the diagnosis and new methods to manage the environment. Eventually, the child, parents, and the entire family unit learns how to cope with this limitation and they learn to adjust the flow of the family due to this condition but until then, there is

a plethora of trial and error involved, which in itself, causes anxiety and exasperation.

A rating of 9 was assigned to the journal.

Figure 3

Key Differences Between Food Allergy and Food Sensitivity

Food Allergy	Food Sensitivity
If someone has a particular food allergy and comes into contact with that food, their body can respond with symptoms almost instantaneously	If someone has food sensitivity they may not even be aware of it as the symptoms can be delayed, subtle, and intermittent
In extreme circumstance a food allergy can result in anaphylaxis	If left unattended food sensitivities can result in auto-immune condition and other health challenges
Food allergies are often diagnosed at a young age and typically the person is aware of the allergy	Food sensitives can be effectively dealt with if proper precautions are taken, i.e. food elimination
Symptoms may include swelling, difficulty breathing, and hives	Symptoms may include digestive discomfort, rashes like eczema, foggy thinking, lethargy, bloating, inflammation and weight loss
Physicians can be consulted to test for food allergy	Food sensitivity can be indicated by skin prick or blood tests

Similarly, Greenhawt (2016) reviewed QoL and other aspects of living for allergic children and assessed indices developed for specific types of food allergy that have been developed over the past 10-12 years. The author noted that some food allergies have worse outcomes with respect to QoL than other food allergies (in particular, milk and egg allergies have lower QoL than nut allergies). Also, having a lower income, having more than one child diagnosed with a food allergy, and having

children with co-morbidities lowers QoL for parents and other caregivers. Availability of an auto-injectable epinephrine device increases QoL for both the child and the caregiver as they feel safer, more confident that they are in control, and able to provide a treatment if an adverse reaction were to occur. Other variables that may affect the relationship between QoL and food allergy include marital status, number of children in the family, employment status, and other socioeconomic factors. Children with allergies that come from lower-income homes have a much lower self-reported QoL than children who come from families that can afford to compensate for this limitation or can afford treatment that will allow them to increase their overall QoL. A rating of 8 was assigned to the journal.

King, Knibb, & Hourihane (2009) found that, within the family, mothers have the highest levels of anxiety, stress, and feelings of paranoia, while fathers have tremendously lower levels of these traits. This is possible because mothers are more involved in the day-to-day care of the children. Additionally, mothers, especially stay-at-home mothers, are normally in charge of buying and preparing food for the family, including the child with the peanut allergy. They are, therefore, usually responsible for reading the food labels and they feel the pressure to determine whether the food is safe for consumption by the food allergic child. As a result, mothers usually have lower QoL and psychological health compared to other members of the family. The stress and anxiety worsens and the QoL of mothers decreases greatly if the child has an adverse reaction after eating something that the mother has prepared or after consuming an individually-packed item that the mother has deemed safe. If the reaction was quickly controlled and it did not lead to major health issues in the child, in these situations, the mother suffers more from the guilt or from feeling inadequate

as a parent rather than from the reaction itself. A rating of 8 was assigned to the journal.

Reading food labels and deciding if an item is safe for consumption creates a tremendous burden on those responsible for this task. Due to this burden, some conservative parents choose to completely ban foods that may contain the life-threatening allergen from their home. Thus, even the adults in the home and the non-allergic siblings are also prohibited from eating this food. According to Warren, Walkner, & Gupta (2016), who assessed general QoL and health or food-related QoL (the latter being defined as the experience of the illness rather than its severity) among children afflicted with a food allergy, one of the principal factors affecting health-related QoL of children with food allergy is a disruption of their regular dietary practices. Children with tree nut and peanut allergy report higher health-related QoL if they eat food displaying “may contain” labels compared to afflicted children who are not allowed to eat “may contain” labeled food. Food allergy-related QoL deteriorates for both children and their parents if the afflicted children previously experienced an anaphylactic reaction. Similarly, a history of epinephrine use, more symptoms, and a higher number of incidents involving food allergens and adverse allergic reactions led to lower QoL. While the possession of an epinephrine auto-injector increases overall QoL in children and their parents, this quickly changes, and QoL decreases when they are faced with anaphylaxis and they have to use this life-saving device. The use of the epinephrine auto-injector creates a permanent negative trauma for all involved, especially the person who had to administer it, which more times than not, is a parent. A rating of 9 was assigned to the journal.

Gallop et al. (2018) investigated the effects that peanut allergy has on the QoL of affected children and teenagers, and their parents. The primary outcomes of their

research were that health-related QoL decreases for those having food allergies compared to those who are not food allergic. The decrease, however, is more for children than adolescents and adults. According to the authors, one of the primary contributing factors to lower QoL is the perceived risk of accidentally ingesting the food substance and having a severe allergic reaction. The perceived risk is higher for parents than children, which may be a reason why the latter may have a higher QoL compared to adolescents and adults. Other factors that are significantly associated with the level of QoL in the case of children include, the number of reactions that the child has had in the past, how recently a reaction has occurred, and the severity of the incident. Children who have never experienced anaphylaxis or those who have experienced it but have no clear memory of the event, have much higher QoL than their counterparts who have experienced anaphylaxis and remember their episode. Aside from lower overall QoL, children who recall particularly traumatic allergic reactions also live in constant fear and anxiety that the incident will repeat itself. A rating of 8 was assigned to the journal.

Topal et al. (2016) studied the psychological disorders of children afflicted with cow's milk allergy and the severity of such incidents. The authors observed that the rates of psychiatric disorder and severity of psychiatric symptoms are higher for those who have cow's milk allergy than those who do not have such allergy. The children without cow's milk allergy were part of the control group. In particular, pre-school children with the allergy may be diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and Attachment Disorder (AD) afflictions. The frequency of ADHD in children with allergies was higher when compared with the healthy control group. ADHD symptom severity was also found to be higher when compared with the control group. Children

with ODD and a cow's milk allergy also showed more frequent bouts of anger and irritability than those without the allergy. The disruptive behavior may also be related to the limitations in diet and the long list of prohibited but popular child-friendly foods that contain dairy. Pre-school children, in particular, have an extremely difficult time understanding why they cannot eat something that another child their age, who they relate to, can. A rating of 8 was assigned to the journal.

The worst parental impact of food allergy of the journals studied in this review was the research conducted by Sampson, Mendelson, & Rosen (1992). These authors documented the experiences of parents whose children died through anaphylactic reactions to food or had near-fatal experiences. They found that the prevalence of food allergy and severe reactions to food items vary considerably between age groups. They noted that 2-2.5% of children less than three years of age were found to be highly reactive to cow's milk, while 8% of children above three years of age were reactive to at least one food item. In cases of the fatalities, all patients were asthmatic and were taking bronchodilator medications at the time of the reaction. While asthmatic patients can certainly experience fatal anaphylaxis due to their already compromised breathing and reactive lungs, the asthma was apparently well-controlled for all the children in this study and, therefore, may not have been a contributing factor. A comparison of cases involving mortality with cases of near-fatal experiences showed that nut allergy was a significant risk factor in the case of the former group and that the presence of a parent, who could recognize early symptoms of a reaction, was a significant differentiating factor. Parents of children with food allergies are on perpetual high alert and constantly aware of their children's symptoms that, at times, may confuse other conditions with anaphylaxis. However, their quick-thinking and

unwavering vigilance could be what saved their child's life in the near-fatal cases. A rating of 9 was assigned to the journal.

Interventions to Cope with Food Allergy Among Children

The third distinct theme found during the critical review was an evaluation or study of different types of interventions that have been developed to help children and their parents cope with food allergies or to minimize its effects when able. The most impactful measure proven to prevent adverse reactions is education for both the children and their parents. Studies focused on raising awareness of food allergy throughout the family unit of afflicted children have helped these individuals remain safe and feel prepared to treat a possible adverse reaction.

This is illustrated in a study by Cummings et al. (2010), who described interventions in terms of self-management factors on the QoL and stress levels of children afflicted with food allergy and their parents. The authors also investigated the association of the factors with tendencies of food avoidance and allergic conditions among children and their mothers with various types of food allergies. Forty-one distinctive child and mother pairs were recruited for the study. A quantitative cross-sectional methodology was used for the research and the authors designed an instrument (Pediatric QoL Inventory 4.0) to measure QoL using Spence Child Anxiety Scale (SCAS) and Perceived Stress Scale. The primary outcome of the study was that the diagnosis of food allergy has considerable influence on psychological distress experienced by the child and the mother, leading to lower QoL for both. However, some clinical management practices may considerably improve QoL. For example, a prescription of an epinephrine auto-injector decreases anxiety for both the mother and the child while food management techniques reduce perceived stress levels for both. Knowing how to choose allowed foods and learning how to find safe

alternatives make mothers feel more secure and confident when feeding their children. Similarly, mothers who take the time to coach and teach their children about healthy food choices to prevent an accidental ingestion of a life-threatening allergen also tremendously increase QoL. A rating of 8 was assigned to the journal.

Prevention of adverse allergic reactions is directly related to increasing the tolerance levels of children with certain food allergies. Blumchen et al. (2019) examined the safety, efficacy, immunological properties, and burden of treatment of oral immunotherapy for children diagnosed with peanut allergy. Using a randomized control trial to evaluate 62 children with a peanut allergy who were assigned to the treatment or intervention group, they observed that the intervention demonstrated a significantly high efficacy for those in the treatment group and a low burden of treatment. Efficacy was high even for low doses and over longer durations. Some of these dosing visits lasted up to five hours which can be very stressful and oftentimes terrifying for children who are aware of their limitations. Nevertheless, efficacy remained high through the patients' fear. At low to moderate doses, the intervention did not show some of the side effects (such as wheezing) associated with comparable interventions. Other adverse effects were also mild to moderate. This made the oral immunotherapy sessions pleasant experiences since minimal effects were provoked. As a result, QoL was significantly higher for this particular treatment compared to reported scores for other interventions which resulted in patients displaying a higher number of adverse effects. A rating of 9 was assigned to the journal.

Another intervention was investigated by Blackman et al. (2020) which consisted of children receiving a course of oral immunotherapy. The intervention was administered to children ages 4-17 years with a peanut allergy. All participants had a physician-diagnosed peanut allergy. The authors obtained QoL scores using an

instrument in which the Food Allergy Quality of Life questionnaire was used. They found a direct correlation between successful oral immunotherapy for peanut allergy in a real-world setting and improvement in the food allergy QoL score, which reflects concerns about accidental exposure and disease severity. Children with a peanut allergy who have been successfully desensitized through such an intervention were found to have fewer concerns about unintentional exposures and severity of allergic reactions as a result of cross-contamination between food items. Anxiety levels and constant vigilance also decreased since these children and teenagers felt safer and more secure venturing out into the world and less limited by their peanut allergy. A rating of 8 was assigned to the journal.

Dantzer & Wood (2019) analyzed the impact of selective nut avoidance and associated oral food challenges on the QoL of children and teenagers afflicted with tree nut allergies and the QoL of their parents. Using a cross-sectional quasi-experimental design, they measured food allergy-related QoL in all participants. The FaQOL-PF scale was used for parents, the FAQOL-CF scale for children ages 8 to 12 years, and the FaQOL-TF for teenagers ages 13 to 17 years. They observed that there may be better QoL for tree nut allergic children and teenagers who underwent oral food challenges, especially among those having only one food allergy, and in the age group 13 to 17 years. Oral food challenges help decrease uncertainties associated with the disease and expand dietary options in a safe, controlled manner. However, oral food challenges may be declined for several reasons, such as a fear of the process, considering it unimportant for the family, a conviction that nuts will not be introduced in the diet, and lack of clarity about the diagnosis. Although oral food challenges occur in a medical setting, while under the supervision of a trained medical professional, children and their parents still fear ingesting an allergen that has

normally been avoided and perhaps banned from the household for several years. A rating of 7 was assigned to the journal.

Evidence has proven that in recent years, oral immunotherapy has a wider patient and parent acceptance rate over oral food challenges as oral immunotherapy increases the allergen reaction threshold. The effects of probiotic and peanut oral immunotherapy on QoL were examined by Dunn Galvin et al. (2018). They selected 62 children with peanut allergy and randomly assigned them to intervention and control groups. They found that there was a significant improvement in QoL for the group receiving probiotic and peanut oral immunotherapy compared to placebo (exhibiting both statistical and clinical significance). QoL increased continuously for the intervention group at three months and also at 12 months after treatment completion. The treatment did not negatively affect the health-related QoL or key aspects of emotional impact, food anxiety, and limitations on social and dietary factors during the treatment phase. Expectations of parents in terms of adverse outcomes from food exposure (as measured by the FAIM scale) were significantly improved with the intervention as well a sustained benefit to at least 12 months after the end of treatment. A rating of 10 was assigned to the journal.

The efficacy of oral food challenge as an intervention was investigated by several authors, one of them being Franxman et al. (2015) who studied whether the administration of oral food challenges to children with food allergies result in an increased QoL for their parents or close caregivers. The authors found that oral food challenges are associated with significantly better QoL among caregivers of individuals with food allergy compared with caregivers of individuals with food allergy who are not administered the food challenge. While the food challenge is not the only determining QoL factor, it may hold additional therapeutic value as a

mechanism to improve caregiver QoL. There is no significant difference in the mean QoL score between caregivers of individuals with food allergy who passed their oral food challenge and individuals with food allergy who had failed the challenge.

According to the authors, this suggests that there may be a less-negative impact to the family from a failed challenge than may be perceived by the provider. This may be due to children and parents growing accustomed to and becoming more comfortable with the allergy and its limitations. Thus, an oral food challenge would have no effect on their lives nor change their day-to-day food choices in any way. A rating of 8 was assigned to the journal.

Similar oral food challenge investigations were performed by Soller, Hourihane, & Dunn Galvin (2014), who observed that food allergy health-related QoL was higher for the allergic group up to two months after completion of the challenge, but it declined at the 6-month stage. Food allergy health-related QoL was the same for the allergic and non-allergic groups (no statistically significant difference) on the day of testing. Researchers believe this to be true possibly because parents felt that their children were at a “safe place” while being at the testing center. Overall QoL increased between the 2-month and 6-month period only for the non-allergic group while it declined for the allergic group. A rating of 8 was assigned to the journal.

The systematic review of the selected 8 studies identified food symptoms related to allergy as reported by the authors.

Figure 4

Key Findings and Recommendations of Included Studies

Study	Method	Key Finding	Recommendations
Cummings et al. (2010)	Cross-sectional questionnaire study	Children with nut allergy had poorer psychological as well as emotional QoL	Prescribing auto-injectors is linked with decreasing anxiety for food-allergic children and their mothers
Blumchen et al. (2019)	Randomized, placebo-controlled, parallel-group trial	A greater number of children tolerated more peanut allergen after administering peanut oral immunotherapy (OIT) for 16 months	Low-dose OIT is a capable, effective, and relatively safe treatment option for peanut-allergic children, leading to improvement in QoL
Blackman et al. (2020)	Quantitative correlational study	Peanut oral immunotherapy (POIT) therapy resulted in significant improvements in Food Allergy Independent Measure Score	Undergo POIT to increase peanut allergen reaction threshold
Dantzer & Wood (2019)	Cross-sectional quasi-experimental design	Oral food challenges help decrease uncertainties associated with the disease and expand dietary options in a safe, controlled manner	Despite the occurrence of oral food challenges in medical settings, trained clinicians, children and their parents still fear ingesting an allergen
Franxman et al. (2015)	Exploratory prospective study design	Oral food challenges are associated with significantly better QoL among caregivers of food-allergic individuals	Food challenges may hold additional therapeutic value as a mechanism to improve caregiver QoL

Discussion

Various types of food allergies are increasing throughout the world and there is a consensus that diagnosis and management of food allergies is often a complex task due to the many variables involved. One of the chief characteristics of food-allergic children and their parents is the high levels of uncertainty associated with food habits and possible changes in diet, which quite often leads to a deterioration of the quality of life for the afflicted child as well as the family. Therefore, the purpose of this research was to study the association between the occurrence of food allergy in children and the anxiety experienced by such children and their parents and immediate families in terms of such factors as psychosocial conditions, parental burden, and parental risk perception. The research also examined the relationship between anxiety, stress, depression, and other quality of life issues in families facing food allergy conditions.

One of the effective strategies for coping with food challenges is the oral food challenge, in which patients are requested to intentionally ingest potential allergens. They are continuously monitored for reactions, which is the gold standard for diagnoses of a food allergy. The gold standard is the double-blinded, placebo-controlled oral challenge, a design that has also been adopted by several of the studies critiqued in this review, including Warren et al. (2016), Topal et al. (2016), and Reier-Nielsen et al. (2019). In this design, bias is minimized, relative to open and single-blinded oral food challenges, as the potential impact of patient or clinician anxiety on the patient's observed reaction to the food is reduced. Participation in a double-blind, placebo-controlled study was shown by some of these authors to result in higher food allergy-related quality of life in children and teenagers (ages up to 17 years). In addition, some of the studies showed improvements in children and their parents (or

close caregivers) irrespective of the actual result of the oral food challenge, while adults and teenagers were shown to have reported higher quality of life scores only when the result of the challenge was to rule out the presence of food allergy. Dunn Galvin et al. (2008), Dunn Galvin et al. (2018), and Topal et al. (2016) supported this finding. Franxman et al. (2015) reported that parents and close caregivers of tree nut allergic children who underwent the confirmatory oral food challenge reported higher food allergy-related QoL irrespective of the challenge outcome. On the other hand, Soller, Hourihane & Dunn Galvin (2014) reported that children undergoing confirmatory oral food challenge experience better food allergy-related QoL two months after the challenge irrespective of results of the intervention, but any such improvement in quality of life decreased after six months among children confirmed to be allergic to food. Another prospective study critiqued in this research also reported that there is no significant difference in food allergy-related QoL in cases of children who are diagnosed with food allergies and children whose diagnoses are confirmed through oral food challenges or other methods 10 years after the intervention (Venter et al. 2016). Based on these results, therefore, it appears that quality of life may increase immediately after an oral food challenge because of some removal of associated dietary uncertainties, but QoL does not increase over a longer period of time.

Another outcome of the critical review of the literature was the observation that QoL for both food-allergic children and their parents can be improved through interventions that aim to lessen some uncertainties associated with food allergies. Uncertainties may be removed either through actual diagnosis and detection of the allergens that may lead to an undesirable reaction, or through better risk avoidance strategies, or through the use of devices such as auto epinephrine injectors (although a

few authors observed that the last method may, occasionally, lead to poorer QoL due to stress). However, this improvement, if any, may be perceived differently by the food allergic children, their parents, or caregivers, for the latter have the additional responsibility of managing the diets of their children and ensuring that they do not accidentally ingest a harmful allergen and undergo a potentially life-threatening anaphylactic reaction. For example, Reier-Nilsen et al. (2018) reported that parents perceived a significant improvement in the QoL of their children over two years, but no such improvement was perceived by the children themselves. One of the interventions discussed in this context is oral immunotherapy, which seems to yield promising results through a process of desensitization (no allergic reaction from the patient who is exposed to increasing amounts of allergic food over a course of time), which is sustained unresponsiveness through the life-long maintenance treatment.

One common food allergy among children which is studied extensively is peanut and tree nut allergy. Several of the journals reviewed evaluated the efficacy of interventions for nut allergy. According to Blumchen et al. (2019), ingestion of only small quantities of the allergen may lead to potentially life-threatening allergic reactions and peanut is the most common allergen to lead to food-induced anaphylaxis in childhood. Patients are advised by their treating physicians to strictly avoid peanuts, but accidental reactions are common due to the widespread use of peanuts in the food industry. As a result, physicians advise peanut-allergic children and their parents or other caregivers, to have auto-injectable epinephrine readily available at all times. Unfortunately, this reduces QoL for patients and this necessitates a need for an allergen-specific therapy in this group of patients, as commented by several authors. Recent research has focused on the therapeutic option of oral allergen-specific immunotherapy. Published trials on peanut oral immunotherapy have demonstrated

clinical desensitization of most of the patients, although different doses for maintenance were used by different physicians or during different intervention studies. Recent research has focused on the therapeutic option of oral allergen-specific immunotherapy.

Like peanut allergy, those allergic to tree nuts endure similar consequences. The smallest exposure may result in a possible life-threatening allergic reaction, and depending on the situation an individual is in, complete avoidance is not always possible. Since accidental exposure can be detrimental to the health of these patients, they are also advised to have auto-injectable epinephrine within reach every minute of their lives. Having another limiting factor and the addition of a stressor besides the allergy itself reduces the QoL in patients with nut allergies even further. Not only are these patients anxious and stressed due to potential allergen exposure, they often feel panicked at the thought of having to inject themselves, or in the case of parents, having to inject their child with epinephrine. According to Blumchen et al. (2019), there is a tremendous need for an allergen-specific therapy in this group of patients as well. Several authors have researched different aspects of oral immunotherapy for tree nut allergy; however, these trials were not as successful as the peanut oral immunotherapy studies. One of the restricting features of many of these trials was that they had a small number of participants and only a few included placebo or control groups. Those doing tree nut oral immunotherapy reported mild to moderate adverse reactions among most participants or patients and some patients even suffered from anaphylactic reactions associated with oral immunotherapy dosing. Although the method seems to be an effective treatment option for patients with a tree nut allergy, one of the conclusions that can, therefore, be drawn is that safety has to be evaluated more carefully.

The risk of fatal food reactions is a source of anxiety for patients and families. As identified in the critical review, Sampson et al. (1992) identified six children and adolescents who died of food anaphylaxis and compared these participants with seven others who nearly died and required intubation during a period of 14 months. Risk factors for fatal and near-fatal reactions included asthma, peanut or nut allergy (10 of the 13 participants were peanut or nut allergic), and delayed administration of epinephrine. As peanut and nut allergies are a risk for food allergy fatality, these specific allergies are often more worrisome to families. While peanut allergy affects 2% of children across the nation on an annual basis, and approximately 12% of these children experience repeated incidents of severe allergic reactions annually, many patients and their parents may overestimate the absolute risk of a fatal food allergy reaction, leading to impairment in QoL. Several factors may cause fear and anxiety in patients and families living with a food allergy, but paramount among them is risk perception.

Food allergy impacts the QoL of caregivers, although pediatric allergist specialty care may lower the degree of this impairment to an extent through correct diagnosis and appropriate counseling. As expected, more severe reactions worsen QoL and caregiver QoL impairments can strain relationships between the members of a family. For example, according to Soller, Hourihane & DunnGalvin (2014), in a sample of 2,045 parents of food allergic children, 25% felt food allergy had caused a strain on their marriage or relationship, and 40% had experienced hostility from another parent when trying to accommodate the food allergy of their child. Whether food allergies increase patient anxiety and depression has been questioned, and studies designed to answer this question have been shown to be inconsistent in this review. Dantzer & Wood (2019) concluded that symptoms of anxiety and depression

were more common among adolescents aged 14–21 years with a food allergy, according to maternal (but not self) report, and that levels of depressive symptoms may persist into young adulthood. However, Blumchen et al. (2019) did not demonstrate increased anxiety in food allergic children 8–16 years of age compared with children from a general pediatrics clinic.

Based on the critical review, the importance of finding balance in food allergy management is paramount. According to some of the journals reviewed, four response patterns may be observed across many food allergy families: balanced psychosocial functioning with high food allergy management skills and adequate vigilance (this seems to be the most predominant), high responders with adequate management skills and high anxiety (this is also a commonly found response), low responders with both low management skills and low vigilance (only a few families exhibit such behavior), and anxious high responders with high management skills and extremely high maternal anxiety (some families exhibit such behavior). One role of the healthcare provider in food allergy management is to help patients and families find the difficult balance between adequate vigilance and excessive anxiety, recognizing that this is part of a developmental process.

Children and adolescents with food allergies have a greater risk of social difficulties but a lower likelihood of conduct and hyperactivity disorders. Research shows that coping with a food allergy, rather than being a simple strategy, comprises the cumulative history of repeated interactions of food and relationships in a child's developmental progress. Also, a minority of children may be at risk for alexithymia – a personality construct that can be expressed as the inability to adequately express emotions through speech. This impairment may manifest in some patients as somatoform bodily sensations, which occur when the individual misreads physical

expression of emotion as a physical expression of disease. This may result in clinical misdiagnosis when a patient presents with somatoform manifestations of anxiety misattributed to food allergy. In clinical experience, this is typically accompanied by anxiety and frequent complaints of symptoms attributed to non-ingestion food exposures. Careful evaluation is required to understand whether symptoms are due to an immunoglobulin E(IgE)-mediated mechanism or anxiety. This study also found that, while there is comfort for patients in knowing that the epinephrine auto-injector is an effective treatment for accidental allergic reactions, higher rates of food-related anxiety have been associated with epinephrine carriage. It is unclear whether this increased anxiety is directly related to carrying epinephrine or to the perception that the food allergy is severe enough that epinephrine may be needed. This requires further research in the future.

Conclusion

Allergic conditions of various types are usually the most frequently identified medical symptom in populations across the world. Food allergy is popularly described as an abnormal reaction of the body's immune system when food is ingested, that may have severe, even fatal consequences. The risks and consequences associated with reactions to food may give rise to anxiety in food allergic patients, their parents, and their families – especially as food allergy onset is common among infants and very young children, who constitute as very vulnerable segments of the population. The swiftness of onset of many food allergies, the fact that they may be triggered by the ingestion of commonly available food substances, and the difficulty of diagnosis and selection of preventive medication often cause high levels of stress and anxiety among children and their parents or other caregivers. Such allergies have no cure and parents of food allergic children exert considerable efforts and devote resources to create an

emergency preparedness state in order to ensure the safety and well-being of their offspring.

The rationale of this systematic review study was to investigate the relative lack of information that children suffering from various types of food allergies and their parents encounter, so that a broad set of recommendations can be made to dispel some of their doubts, lower their anxiety levels, and improve their quality of life. Based on the review, an effective strategy for coping with food challenges was found to be the oral food challenge, in which patients are requested to intentionally ingest suspected allergens. They are subsequently clinically observed for an onset of reactions, which is the protocol required to establish a definitive diagnosis of food allergy. Lastly, it was concluded that food allergy impacts the quality of life of caregivers, although pediatric allergist specialty care may lessen the degree of this impairment through correct diagnosis and appropriate counseling. As expected, more severe reactions worsen quality of life and caregiver quality of life impairments can strain relationships between the members of a family.

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