FOOD SENSITIVITY TESTING IN CHILDREN: A CASE STUDY AND NARRATIVE REVIEW

by

Kelly Jaimes

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FOOD SENSITIVITY TESTING IN CHILDREN: A CASE STUDY AND NARRATIVE REVIEW

Project Approved:

Supervising Professor: Kelly Fisher, DCN, RD, LD

Department of Nutritional Sciences

Rebecca Dority, MS, RD, LD, CDCES

Department of Nutritional Sciences

Heidi Conrad, PhD

Department of Chemistry and Biochemistry

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ABSTRACT

Despite the significant prevalence of food intolerances (FI) in children and adolescents (2 to 18-years-old), food intolerance mechanisms and testing are severely misunderstood and under researched. A FI is a non-immunological response that occurs after consuming a specific food particle causing gastrointestinal (GI) issues such as bloating, nausea, diarrhea, and abdominal pain. The lack of understanding of FIs may result in many children following an unsupervised elimination diet, which increases the risk of developing nutrient deficiencies. The objectives of this study were to assess the impact on quality of life (QOL) that FIs have towards children and adolescents by analyzing available literature and utilizing a case study participant. Findings suggested that more research is needed to understand FI to improve the QOL in children and adolescents.

CHAPTER I

INTRODUCTION

Food intolerances are often confused with food allergies or the umbrella term food hypersensitivity. A food intolerance is a non-immunological response that occurs after consuming a specific food particle. IgG antibody testing has been explored as a possible biochemical indicator of food intolerance. However, IgG antibodies are naturally found in the body and therefore elevated levels are not specific to a food intolerance.[1] Because food intolerances are not explained by biochemical abnormalities, meaning there is no biological marker to identify if an individual has a food intolerance, diagnosis is especially diffcult.[2] Common symptoms of food intolerances include gastrointestinal (GI) issues such as bloating, nausea, diarrhea, and abdominal pain.[2,3,4]

In contrast, a food allergy is an immunologic adverse reaction after eating a specific food in which the body detects the allergen as a foreign body.[1] As a result, there is an increased concentration of the IgE antibody corresponding with an immune reaction following consumption of the allergen.[5] Elevated IgE antibodies are seen during times of immune distress because they are the most potent immunoglobulin.[5] Unlike food intolerances, symptoms related to food allergies may impact the respiratory system such as the acute onset of anaphylaxis and a scratchy throat or have identifiable signs on the skin such as hives or redness.[1] However, they also result in GI symptoms similar to food intolerances, which complicates differentiation between the two.

Currently, children with suspected food intolerance have limited testing, and the available resources are very expensive and not typically covered by insurance.[1] Before commencing with food intolerance testing, individuals will be asked to undergo clinical investigations such as blood and fecal tests, endoscopies, or radiological imagining to rule out organic

disease.[4] Next, individuals may be asked to take a hydrogen or methane breath test to assess carbohydrate malabsorption.[4] Humans do not naturally expel hydrogen, so if detected, it is a sign that there is a digestion issue since it is the product of fermentation by the microbiota in one's GI system.[4] Similarly, individuals may use methane tests to detect if the body is combining the hydrogen with carbon dioxide to produce methane which is then expelled by the lungs.[4] Overall, clinical test results often come back as normal which results in frustration and confusion for families, not to mention the expense.

While an average of 25-40% of the population above six months has an identified food intolerance, the incidence in children who were three years old was only 2.3% and 1% in children older than three.[2,7] Overdiagnosis results in many children to unnecessarily following unsupervised elimination diets, which can lead to nutrition inadequacy, limited growth of gut microbiota, an increased risk for weight loss, and overall lower their quality of life (QOL).[4] The gold standard for food intolerance testing is the food challenge.[4] First, the suspected food is excluded from the diet and symptoms are observed for changes in symptoms, and next, the individual reintroduces the food and compares symptoms.[4] It is significant to mention that those with food intolerances can often tolerate small amounts of the food.[2] In addition to the fact that total elimination is usually unnecessary, it is practically impossible to achieve. Common chemicals related to food intolerances are salicylates, vasoactive amines, glutamates, and caffeine, which are substances found in virtually all foods ranging from apples, bananas, and dark chocolate to cheese and processed or cured meats.[4] Elimination diets should be implemented with caution and under the supervision of a professional, like a Registered Dietitian (RD), to prevent the child from developing nutrition inadequacies.[1,2]

Current studies suggest that food intolerances cause children to experience a decreased QOL, especially in a school or social setting.[3,6] This population often includes children diagnosed with Irritable Bowel Syndrome (IBS), who have a high prevalence of food intolerances.[3] With limited testing available, children often experience avoidance behavior when eating foods, and experience anxiety with fear of manifesting a GI symptom.[3,6] Children often learn to manage their symptoms with other practices, but there is limited research for practitioners to provide evidence-based guidance. Further research is necessary to develop a standardized method for treatment and symptom management. The aim of this paper is to fill the deficit of knowledge of food intolerances in children by increasing awareness to its severity and prevalence using literature and a case study. The research question was: in between 2 to18 years old with children with suspected food intolerance, what is the impact on GI symptoms (abdominal pain, weight loss, stool changes, nausea, vomiting, and scratchy throat) or QOL?

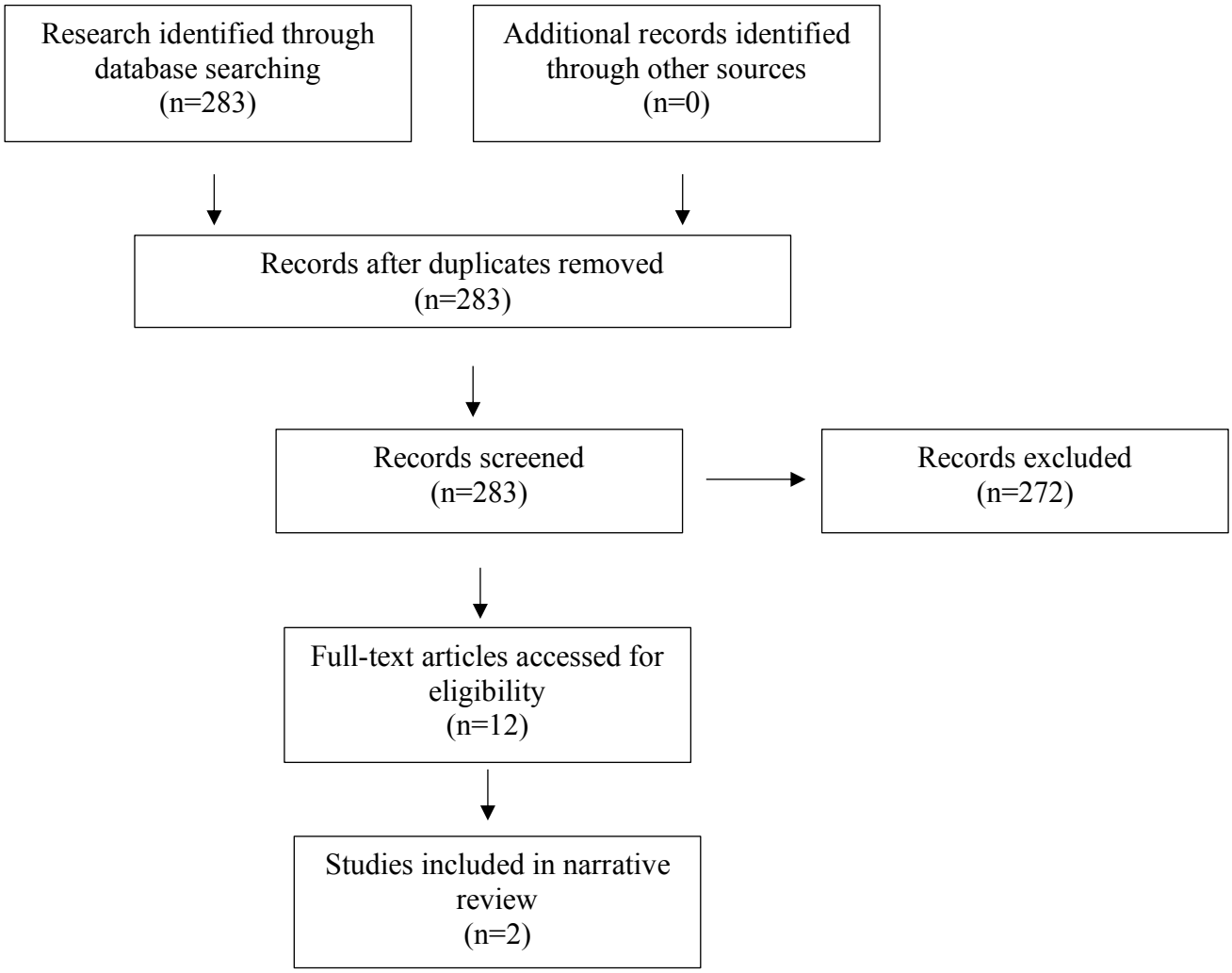
CHAPTER II

METHODS

An electronic literature in the MEDLINE database search was conducted in January 2023. The database was searched focusing on two key words: “quality of life” and “food intolerances.” GI symptoms included abdominal pain, nausea, vomiting, constatation, or diarrhea, connected by the Boolean operator “OR.” The term “food intolerance” was extended to food sensitivity, food challenge, or IgG, connected with the Boolean terminology “OR.” Each criterion (“quality of life” and “food intolerance”) was connected with the Boolean operator “AND,” to include articles which only discussed the association between quality of life, usually related to GI symptoms, and food intolerances. Further criterion of the literature included articles published between January 2013 to January 2023 and populations aged 2-18.

Upon retrieval, articles were reviewed for applicability by analyzing the abstract and full-text article for pertinence of the connection between GI symptoms and food intolerances. Inclusion criterion included: children aged 2-18 years old, decreased QOL (anxiety, depression, and social distress), GI symptoms (abdominal pain, nausea, vomiting, constatation, or diarrhea), and practices to improve QOL related to food intolerance symptoms (avoidance, food modification). The evaluation of IBS was permitted because it is a syndrome resulting in inflammation and not an organic disease. Exclusion criterion were: autism, attention deficit hyperactivity disorder, allergies, and associated symptoms (asphyxiation). Published narrative reviews were utilized for background information of food intolerances and associated symptoms, while primary, clinical trials were utilized for measurements of QOL and associated GI symptoms.

PRISMA Flow Chart



CHAPTER III

REVIEW OF THE LITERATURE

Two studies observing the connection between food intolerances and decreased QOL and GI symptoms in pediatrics were identified after conducting the literature search.[3,8] Both study designs were cross-sectional and mixed methods.[3,8] The first study assessed the prevalence of food intolerances amongst children diagnosed with IBS and their relationship with a decreased QOL.[3] The second study used questionaries to gather information on the frequency in consumption of the food intolerance, food intolerance self-reported symptoms, and decreased QOL.[8]

Both studies[3,8] recruited participants at the Texas Children's Hospital in Houston Texas. One study included participants aged 7 to 18 with one group who met the Rome III diagnostic criteria for IBS without another chronic illness (n=154) and a control group of healthy children without IBS (n=32).[3] The other study included a population of children aged 11 to 17 with functional gastrointestinal disorder (FGID) without any chronic illness (n=25).[8]

Both studies examined the association between decreased QOL in children with food intolerances using questionnaires such as the Child Food and Symptom Association Questionnaire, Children's Somatization Inventory, The Anxiety and Depression T scores[3], or the Food Symptom Association, Pediatric Quality of Life Inventory Generic Core Scale, and Pediatric Quality of Life Inventory Gastrointestinal Symptom Scale.[8]

Chumpitazi, et al.[3] analyzed the avoidance of 97 food intolerances using the Child Food and Symptom Association questionnaire from 2008 to 2014. Food intolerances were later categorized into 8 groups (fruits, vegetables, dairy, condiments, meats/proteins, grains, beverages/other, sweets).[3] Then, children aged 7 to 18 years old were asked to complete a pain

diary for ≥ 7 days in which they rated their pain on a scale of 1-10 (0 being "no pain at all" and 10 being "the worst pain you can imagine").[3] Researchers ensured that children were completing their pain diaries daily. The children's psychosocial distress was also measured using the Children's Somatization Inventory which analyzes 35 symptoms rated by the children on a scale of 0-4 (0 being "not at all" and 4 being "a whole lot").[3] Totals for this questionnaire range from 0-140, in which the higher the score, the greater the psychosocial distress.[3] In this particular case, the distress related to functioning in a social setting.[3] When compared to a healthy population, children diagnosed with IBS had a high prevalence of food intolerances which increased their psychosocial distress due to fear of GI symptoms. When compared to a healthy population, 93% of children with IBS identified with the manifestation of a food intolerance, or GI symptom, when compared to a healthy population (control group).[3] Children with IBS were found to be most intolerant to cow's milk, fast food, cheese, and other high fat foods when compared to healthy children.[3] Girls had significantly ($P<0.001$) higher incidence of food intolerances when compared to boys, and also practiced more avoidance behaviors ($P<0.001$).[3]

Overall, Chumpitazi, et al.[3] determined that there is a strong relationship between food intolerances with GI symptoms and food avoidance in children with IBS. This finding can be helpful for healthcare workers who treat children with IBS. By identifying the food intolerances of the children with IBS (ideally utilizing the gold standard of the food challenge), RDs may work with these children to identify and limit their consumption of these sources to improve the GI symptoms and consequently improve QOL. Researchers interestingly found that the number of food intolerances does not have a positive correlation with the severity of GI symptoms.[3] This result would be important for healthcare workers to consider when treating children with food

intolerances so that they do not wrongfully assume that one food intolerance is more tolerable or does not severely impact the child as much as a child with multiple food intolerances.

Carlson et al.[8] also used the Food Symptom Association Questionnaire to assess prevalence of food intolerances, but the 25 participants were asked to report their GI symptoms (abdominal pain, nausea, diarrhea, etc.) after ingestion of that specific food.[8] Interviewers asked the children to rate their GI symptoms on a scale of 0 to 4 (0 being "none" and 4 being "very bad"),[8] and the incidence that those symptoms that occurred after ingestion on a scale of 0 to 4 (0 being "none" and 4 being "often" or "always").[8] Next, investigators used the Pediatric Quality of Life Inventory Generic Core Scale to measure the physical, emotional, and social functioning related to QOL. This scale is from 0 to 100 with 100 meaning no impact on QOL.[8] Last, parents were asked to complete the Pediatric Quality of Life Inventory Gastrointestinal Symptom Scale on behalf of their children.[8] To their best judgement, parents would rate the frequency of GI symptoms their child had from a scale of 0 to 100 with 100 being no GI symptoms.[8] Parents were found to perceive their child's QOL much worse than what the child scored on their QOL questionnaire.[8] Upon completion of the questionnaires, children were divided into 8 focus groups according to age (11-14 or 15-17 years old).[8] A moderator presented 82 photos of foods and children were guided to identify which foods affected their GI symptoms, what they did to combat their symptoms, and how those foods may impair their QOL.[8] Children identified spicy foods, pizza, cow's milk, and sodas to cause their food intolerance.[6]

Overall, Carlson et al. found that the frequency of identified food intolerances between sex did not vary significantly, but older children (above 14 years old) were found to have more food intolerances than younger children.[8] This observation could be because older children are more accurate when identifying foods that cause their symptoms.[8] To cope with their symptoms,

some children believed that selecting different ripening stages of fruits (bananas) would not exacerbate their symptoms.[8] They would also reduce portion sizes or eat foods they believed would alleviate their GI symptoms such as crackers, mints, bread, and yougurt.[8] After analyzing the responses of the questionnaires, investigators found decreased QOL in school, sports, and social settings[8]; one participant explained that she does not eat foods that her friends offer her, and only consumes foods from her house.[8] This study can be used to assists health care workers in understanding how the perception of food intolerances, and corresponding GI symptoms impact children's QOL.

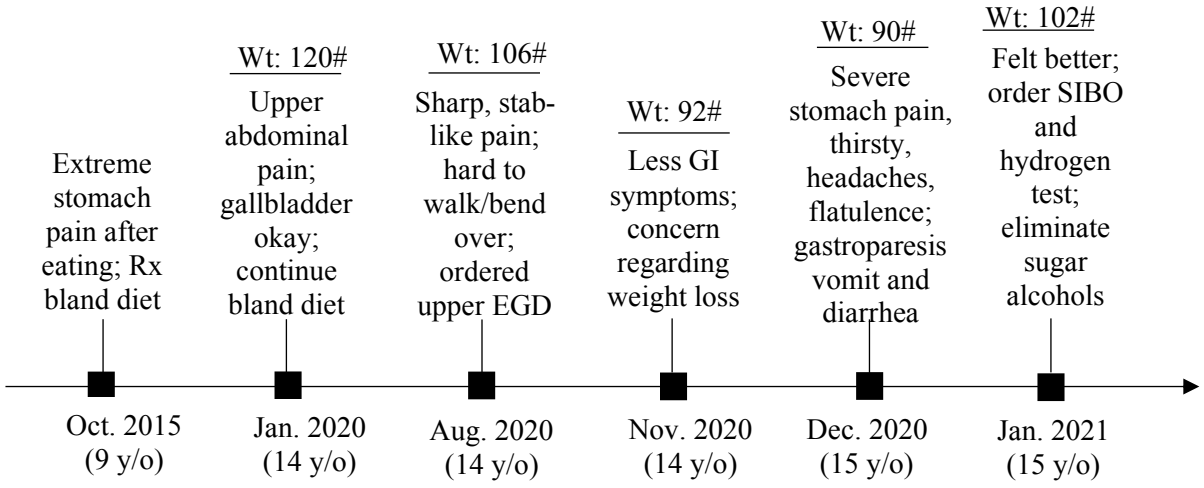
CHAPTER IV

CASE STUDY

The Nutritional Sciences Department at Texas Christian University was contacted by a parent whose daughter, SC, suffered an arduous journey related to food intolerances. SC's mother explained the lengthy timeline to determine that the root of SC's severe GI symptoms was food intolerances. The family provided a copy of SC's medical history to be used and evaluated. In virtual meetings, SC was interviewed with the supervision of her mother to discuss her quality of life related to food intolerances.

SC faced issues with food intolerances for several years. At just age six, SC began to complain of stomach pains. In 2015, at nine years of age, her stomach pains grew consistent after consuming particular foods, like bananas. Her symptoms aligned with that of food intolerances such as abdominal cramping, constipation, and overall difficulty eating. SC visited a pediatric gastroenterologist which would commence her journey of numerous hospital visits and clinical investigation in attempts to identify a diagnosis that would lead to a treatment to improve her symptoms.

Timeline of SC's Symptoms:



SC's symptoms were exacerbated with greasy, sweet, and spicy foods. She reported her abdominal pains to feel like stabs; when severe enough, she struggled to walk and bend over. SC's family had a medical history of gallbladder issues, therefore her doctor ordered a gallbladder ultrasound to eliminate the suspicion of ulcers. When her ultrasound and physical eliminated the possibility of a gallbladder-related issue, the next step was to continue to investigate the underlying cause of SC's symptoms. The doctors ruled out the risk of organic disease after her upper esophagogastroduodenoscopy (EGD) and colonoscopy results came back as normal. Without a diagnosis, SC's GI symptoms sustained, and was prescribed several medications to improve her state. Some of her medications included:

- Sucralfate (Carafate): antacid
- Pantoprazole (Protonix): proton-pump inhibitor
- Famotidine (Pepcid): antacid and antihistamine
- Ondansetron (Zofran): antiemetic
- Hyoscyamine (Levsin): GI antispasmodic

To reduce her symptoms, SC was prescribed a bland diet, including oatmeal, yogurt, roasted cauliflower and salad, and was encouraged to limit her consumption of fried, fatty, and spicy foods. Her day typically includes graham crackers for breakfast, a plain salad for lunch, and typically an assortment of steamed or raw vegetables for dinner.

In just eight months, SC's weight dropped unintentionally from 120 pounds to 106 pounds. At age 14, in November 2020, SC was diagnosed with malnutrition by an RD as evidenced by her decreased appetite and BMI of 16.8. Furthermore, the RD identified SC with multiple food intolerances (such as tomatoes, red dye, poultry, meat, fish, bananas, and lemons) after SC was able to regain some weight and improve her GI symptoms following a supervised

elimination diet. Her greatest relief was avoiding red food dye, which was found in many items such as sodas, strawberry yogurt, and even medications like Benadryl. The RD also facilitated acceptable selections of substitutes to her food intolerances to maintain a better quality of life and improve her nutrition status.

SC is encouraged to maintain her healthy weight by consuming small frequent meals and snacks that are energy dense and high in protein. To continue to eliminate the risk of getting more food intolerances, SC revisits her gastroenterologist every December to ensure her weight is regular for her age and report any GI symptoms she may have.

CHAPTER V

DISCUSSION

While these studies did find notable relationships between food intolerances and a decreased quality of life in children, especially in those with IBS, more studies should be done utilizing the gold standard of a double-blind, placebo-controlled clinical trial. A strength of the one of the studies was its use of mixed methods[3], and a strength of two studies included their use of standardized questionnaires. Furthermore, although Chumpitazi et al. did conclude that children with IBS practice food avoidance to reduce their symptoms, they did not directly address corresponding nutritional deficiencies despite adults with IBS being found to consume nutritionally inadequate diets.[3] Future studies should consider measuring nutritional lab values in children with food avoidant behaviors to determine the severity of this practice on their nutritional status. A limitation of the studies was the small to modest sample sizes, so prospective studies may deliberately recruit a larger population for their study.

Additionally, a limitation of this paper is that it is only supported by two, peer-reviewed, primary, research studies.[3,8] To apply more outcomes to SC's case study, more research in food intolerance testing and mechanisms is necessary when establishing a treatment plan. Lastly a significant statistic of the prevalence of food intolerances used in many articles (20%)[7] comes from a study done in Germany. Prevalence of food intolerances may differ in the United States.

Food intolerances are misunderstood despite the substantial impact they have on the quality of life of patients. Without an antidote, change in diet and medications to alleviate symptoms are helpful management tools. Similar to the findings of Carlson et al., SC modifies her foods to include a wider variety in her diet. She has found that substituting marinara sauce in

pizza for alfredo sauce has been beneficial not only to avoid a flare in her symptoms, but to also participate in social gatherings with her friends.

SC's food intolerances were consistent with the most common culprits. SC was concluded to be intolerant to poultry, meat, and fish, which are all high in protein. As determined by Shudong Lin et al., high protein foods are common food intolerances.[6] Furthermore, SC is intolerant to tomatoes which contain glutamate, a common chemical causing food intolerance.[4] Next, SC is also intolerant to bananas and lemons which contain another common chemical intolerance of salicylates.[4]

SC's pains were severe enough to be checked out of school early, first demonstrating how food intolerances would impact her QOL in a school setting. The severity of food intolerance symptoms and increased fear of consuming the foods exacerbating those symptoms has decreased the QOL of SC. She has missed many school days to attend food intolerance testing or due to a flare in symptoms. Unfortunately, many of medications used to relieve symptoms can only be used short term and, ironically, common side effects include GI distress. The greatest hurdle for SC and her family was being taken seriously by the medical team. At first, doctors blamed SC's weight loss as anorexia and attempted to dismiss her concerns. SC's parents were not satisfied with the accusation, so SC underwent two procedures, a, upper ECG and a colonoscopy at just 14 years old, to rule out organic disease. SC and her family wish that more doctors would have taken the time to listen to their concerns, perhaps then SC could have avoided two unnecessary procedures. Health care workers must take the severity of food intolerances more seriously to avoid the wrongdoings that were done to SC and her family to another patient.

CHAPTER XI

CONCLUSION

Children with food intolerances have consistently been shown to have a decreased quality of life as a result of common GI symptoms. The gravity of GI symptoms caused by food intolerances is both physically painful and interferes with socialization of the child. The lack of standardization for diagnosing food intolerances causes confusion in understanding and treating them among health care professionals. The outcomes of these studies express the need for further research in understanding food intolerances so these children can live a normal, healthy life.

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