

2020

An Investigation Into the Prevalence of Food Hypersensitivity Amongst Children in the Early Years Service in Ireland

Ruta Patel
Technological University Dublin

Follow this and additional works at: <https://arrow.tudublin.ie/sfehthes>



Part of the [Food Science Commons](#)

Recommended Citation

Patel, R. (2020). *An investigation into the prevalence of food hypersensitivity amongst children in the early years service in Ireland. Masters dissertation. Technological University Dublin. doi:10.21427/s57a-g581*

This Dissertation is brought to you for free and open access by the School of Food Science and Environmental Health at ARROW@TU Dublin. It has been accepted for inclusion in Theses by an authorized administrator of ARROW@TU Dublin. For more information, please contact arrow.admin@tudublin.ie, aisling.coyne@tudublin.ie, vera.kilshaw@tudublin.ie.



AN INVESTIGATION INTO THE PREVALENCE
OF FOOD HYPERSENSITIVITY AMONGST
CHILDREN IN THE EARLY YEARS SERVICE IN
IRELAND

By Ruta Patel

Technological University Dublin

M Sc. Food Safety Management
January 2020

Thesis Supervisors:
Dr. Ciara Walsh
Pr. Sara Boyd

A Dissertation submitted to Dr. Amit Jaiswal in
partial fulfilment of the degree M Sc in Food
Safety Management Programme

Abstract

In the early years services in Ireland, the study studied the prevalence of hypersensitivity to food and the associated food among children between the aging of 0 and 12. Participants were 980 EYS recorded with the State and Department of Education of the Republic of Ireland and Northern Ireland during 2019. In the descriptive-analytical report, the management guideline for answering these questions by the EYS was circulated electronically via emails and included information regarding class, age, food hypersensitivity and food that induce hypersensitivity among children. Results on the prevalence of allergens to Food and Coeliac diseases and current policies to control them are discussed. In this research, it was found that nearly half of the male children are suffering from food hypersensitivity—be it Food Allergy, Coeliac disease, any kind of Food Intolerance and around 40% of the female children with and the experience of food hypersensitivity. Facilities with the same expertise are making a lot of commitment and are attributing their know-how on dietary allergens. Northern Ireland beat the Republic of Ireland by contributing more than 70% in data analysis.

Declaration

I hereby certify that this material, which I now submit in part fulfilment of the requirement for the award of MSc in Food Safety Management, is entirely my own work and has not been taken from the work of others save and to the extent such work has been cited and acknowledged within the text of my work. This thesis was prepared according to the guidelines for dissertation production in the M.Sc. Food Safety Management and has not been submitted in whole or in part for an award in any other Institute or University. The work reported on in this thesis conforms to the principles and requirements of the Institute's guidelines for ethics in research. The Institute has permission to keep, to lend or to copy this thesis in whole or in part, on condition that any such use of the material of the thesis be duly acknowledged.

Signed _____

Ruta Patel

Date _____

Acknowledgements

I would first like to thank my thesis advisor Pr. Sara Boyd of the TU Dublin. The door to Prof. Sara Boyd office was always open whenever I ran into a trouble spot or had a question about my research or writing. She consistently allowed this research to be my own work but steered me in the right the direction whenever he thought I needed it.

I would also like to thank the experts who were involved in the validation survey for this research project: Dr. Ciara Walsh (Research Supervisor for Safefood and Professor in TU Dublin), Mr. Fintan Moran (Course Chair M Sc. In Food Safety Management), Dr. Amit Jaiswal (Lecturer in M Sc in Food Technology/ Engineering in TU Dublin) and Miss Eliza Dilma (M Sc student in TU Dublin). Without their passionate participation and input, the research could not have been successfully conducted.

I would like to thank Safefood for providing the funding and giving me this opportunity to work on this research project.

Finally, I must express my very profound gratitude to my parents and to my grandparents, for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

Ruta Patel

Abbreviations list

Glossary

TU Dublin – Technological University Dublin

FA – Food Allergy

ROI – Republic of Ireland

NI – Northern Ireland

FHS – Food Hypersensitivity

GI - Gastrointestinal

IgA - Immunoglobulin A

IgD - Immunoglobulin D

IgE - Immunoglobulin E

EYS – Early Years Services

FGID: Functional Gastrointestinal Disease

IBS: Irritable Bowel Syndrome

FODMAPs: Fermentable Oligo Di Monosaccharides and Polyols

CD – Coeliac Disease

Table of Charts, Tables and figures

| |
|--|
| Table 1: Food allergy, intolerance and aversion |
| Figure 1: Diagnostic-therapeutic protocol to assess food allergy / intolerance. |
| Chart 4.1. Total Number of Children under age of (0 to 12 years) distribution in Childcare facility in ROI county wise |
| Chart 4.2. Total number of female children under age of 0 to 12 years in ROI county wise |
| Chart 4.3. Total number of male children under age of 0 to 12 years in ROI county wise |
| Chart 4.4. Total number of children under age of 0 to 12 years in NI county wise |
| Chart 4.5. Total number of female children under age of 0 to 12 years in NI county wise |
| Chart 4.6. Total number of male children under age of 0 to 12 years in NI county wise |
| Chart 4.7. Total Children In Island Of Ireland |
| Chart 4.8. No. of children with food Intolerances in ROI |
| Chart 4.9. No. of Children with food allergy in ROI |
| Chart 4.10. No. of children with Coeliac disease in ROI |
| Chart 4.11. Total No. of children with food intolerances in NI |
| Chart 4.12. Total No. of children with food allergy in NI |
| Chart 4.13. Total No. of children with Coeliac disease in NI |
| Chart 4.14. Total No. of children (0-12 years) with food hypersensitivity in ROI |
| Chart 4.15. Total No. of children (0-12 years) with food hypersensitivity in NI |
| Chart 4.16. Total No. of children (0-12 years) with food hypersensitivity in Island of Ireland |

Chart 4.17. Gender wise distribution of Food Hypersensitivity in Island of Ireland

Table of Contents

| | |
|--|-----------|
| 1. Section 1: Literature Review..... | 10 |
| 1.1. Preamble..... | 10 |
| 1.2. Food Allergies vs food Intolerances..... | 13 |
| 1.3. Types of allergies caused by Food..... | 14 |
| 1.4. Types of food intolerances..... | 15 |
| 1.5. The 14 Food Allergens declared by the EU..... | 21 |
| 1.6. 14 Food Allergen-Specific IgG Antibodies in Human Body..... | 23 |
| 1.7. Coeliac Disease..... | 25 |
| 1.8. Symptoms of Food Allergy and Food Intolerances..... | 26 |
| 1.9. What are the established dietary tolerances?..... | 27 |
| 1.10. Proposed Further studies/methods for managing food intolerances..... | 28 |
| 1.11. The 93 Foods in-depth test which are available for food intolerances..... | 29 |
| 1.12. Diagnostic - Therapeutic Protocol for Food Intolerance Management..... | 31 |
| 1.13. Anaphylaxis Shock..... | 35 |
| 1.14. EpiPen and its Usage..... | 37 |
| 2. Section 2: Methodology..... | 39 |
| 2.1.Introduction..... | 39 |
| 2.2.Types of Research..... | 40 |
| 2.3. Methods used in study, Data Collection and Data Analyzation..... | 42 |
| 2.3.1. Research Planning and Organizing..... | 43 |

| | |
|---|-----|
| 2.3.2. Literature Review Writing and Survey Generation..... | 45 |
| 2.4. Cover Letter for Island of Ireland..... | 46 |
| 2.5. Safefood - Food Hypersensitivity Questionnaires..... | 47 |
| 2.5.1. Food Hypersensitivity Questionnaire for the Early Years' Service in the Republic of Ireland..... | 47 |
| 2.5.2. Food Hypersensitivity Questionnaire for the Early Years' Service in the Northern Ireland..... | 58 |
| | |
| 3. Section 3: Results..... | 69 |
| 3.1. Comments and Recommendations from childcare facilities..... | 93 |
| | |
| 4. Section 4: Discussion..... | 95 |
| | |
| 5. Section 5: Conclusions and Recommendations..... | 99 |
| | |
| 6. Section 6: References..... | 100 |
| | |
| 7. Section 7: Proposed Journal Article..... | 103 |

Section 1: LITERATURE REVIEW

1.1. Preamble

Limited data and information available in area of Food Hypersensitivity increases vulnerability and decreases the chances of survival even though food hypersensitivity is not fatal in most of the cases and is chronic, sudden and requires immediate treatment response.

Below are some facts for European populations majorly which depicts necessity of research in this very area.

- Nationally 4% reported wheat allergy / Coeliac disease (Board Bia, April 2, 2017)
- 17 million Europeans suffers from food hypersensitivity - 28% of Irish population
- 15% Irish consumers need to see a specialist due to their food hypersensitivity
- 1 in 50 Irish Children have life threatening nut allergy
- 10% of children have more than one allergic disorder (allergen prevalence has doubled in past 20 years)
- In 2019 only 9 cases of deaths were reported because of food hypersensitivity world widely.

Limited information is available on HSE food allergies and coeliac disease. However, there are data banks around the country. As example, the Central Statistics Office, the Schools and a variety of support groups would have their data sets, e.g. Irish Food Allergies Network (IFAN), Irish Coeliac Society, etc. - to name a few (Pasqui et al., 2015).

Some of this information is available on websites (e.g. coeliac society estimates that 1% of the population of Ireland has coeliac disease) or by contacting organizations. Most of these experiments are focused exclusively on IgE food allergies with very limited availability. The EAACI systematic review identified food allergy levels for 6-year-olds of 1.1–1.2 percent and 1.4–2.3 percent for 11 to 17 years of age dependent on a health history / food challenge. Such estimates

were only 0.4 to 4.2% in 6-to 10-year-olds and 0.1 to 5.7% in 11-to 17-year-olds based on food challenge alone. FHS reported previously on the Isle of Wight (IOW) of 6, 11 and 15-year-old cohorts. At 6 years of age, FHS prevalence was 20 of 798 (2.5%) (95% CI 1.5 to 3.8), mainly based on Open Food Challenge (OFC) and Skin Pick Test positive response history (SPT). It is observed that, for older children, FHS was 18 in a cohort aged 11 years out of 775 (2.3 per cent) and 17 in a cohort aged 15 years out of 1975 (2.3 per cent). This final year project involves contacting organizations to gain access to these datasets. (Venter *et al.*, 2016)

No treatment for food allergies is currently available. In fact, the management of this chronic disease involves the strict prevention of "trigger" food and emergency medical intervention when accidental consumption occurs. Although individuals with food allergies normally do not experience symptoms of their disease daily, as with other chronic diseases, the need for constant food protection puts a heavy burden on them and their families. There are many reports illustrating the negative impact of food allergies on the quality of life of sufferers, their relatives and caregivers. For example, Primeau *et al.* (2000) reported significantly more daily disturbances in the activities of children with peanut allergies than in children with rheumatological diseases (or chronic orthic diseases examined). There are claims that food allergies are both money and time more expensive; with an FSA (2002) review, it is estimated that food allergies take a half an hour longer to shop for those suffering from food allergies. Food intolerances like coeliac disease (as opposed to FA) are known to have an equally negative impact on patients' quality of life.

Increased public understanding of the connection between diet and health has reinforced the idea that "allergy" to dietary, food additives, drinks and even water causes a wide range of distressing acute physical and psychological issues as well as chronic, debilitating diseases.

When a person suffers from symptoms that have defied medical diagnosis but nevertheless impair their quality of life, it is perfectly understandable that the quest for a cause will include

areas that are not generally considered pathological. (Joneja and Ehmann, 2000). Almost every symptom experienced by humans has been blamed for food ingestion. Tiredness, fatigue, anxiety, irritability, mental foggiess, insomnia, concentration deficit with hyperactivity disorder, migraine headaches, convulsive pathologies, tachycardia, palpitations, IBS, Crohn's, musculo-skeletal, rheumatoid pain, blurred vision, Raynaud's syndrome as well as asthma, rhinitis, eczema, urticaria.

The diversity of reactions mechanisms and individual idiosyncrasies, which mediate symptoms with obvious medical signs, makes it extremely difficult in practice to identify the culprit foods. In this way, numerous practitioners have over-rejected or even fictitious the whole field of "food allergy." The popular belief of "food allergy" is a situational, somatic or mechanical disorder with the negative connotations that these sects typically have, although some of these professionals may be more educated. In several reports of people with food-related diseases and controls, variations in the history of depression and anxiety disorders, somatization, and stress related conditions were reported.

In clinical practice, both organic and psychological factors may be involved, especially when patients feel that doctors don't take their symptoms seriously. As Charles May, the father in food allergy tests, wrote in the New England Journal of Medicine,' The response in human beings and therefore in interplay between soul and body is essential to understand that the astounding force of self-deception can only be understood by familiarity with blind food challenges.'

1.2. Food Allergies Vs Food Intolerance

Food hypersensitivity (FHS) is the umbrella term for food allergies (FA) [IgE and non-IgE mediated] and non-allergic food hypersensitivity as currently defined by the European Academy of Allergy and Clinical Immunology (EAACI) and the World Allergy Organization. Food intolerance is often mistaken for allergies to food. Food allergy is an immune response to certain products, including chocolate, fish or chickens. Food allergy symptoms occur very quickly when a food is eaten or rarely stimulated. It can cause a swelling of the rash or throat just after a tiny amount of food is approached. A practitioner may administer examinations for the skin or blood to determine allergies.

Food intolerances can occur immediately after the food is eaten or after an hour or the next day the reaction can be delayed. Food intolerances can also be triggered by an accumulation over a span of one or more days of a particular food or related food. No clinical trials will determine which foods or community of foods induce food intolerance symptoms. There is no common cause for food intolerance, rather food that activate symptoms that are known together as "food intolerances." There are different methods known which can causes food intolerances. No process triggers aversion of food; instead, food may cause symptoms in a variety of ways that are classed as ' food intolerances ' together (Carter, 1998)

1.3. Types of allergies caused by food

➤ Food intolerance or food sensitivity:

A reproducible, uncomfortable (i.e. adverse) response to a diet or food component not medically dependent can be defined as food intolerance or allergy. It occurs even when the person affected cannot recognise the food type. A specific metabolic, pharmacologic or immunopathologic cause for this reaction or uncertain or contentious process can occur. The offensive agent may be one product or component, but many different foods also occur, particularly in the case of IgE-mediated food allergy.

➤ Food allergy or food hypersensitivity:

There is reproducible food resistance and evidence of an unnatural immunological reaction to food both in food allergy or hypersensitivity.

➤ Psychologically-based food reactions (food aversions):

These include psychological aversion, when the individual ignores eating for psychological motives, and psychological sensitivity which is not a direct result of the food nor emotions associated with the food. This is a disagreeable corporal response. The appearance of food in an unrecognizable shape does not cause psychological aversion.

➤ Adverse effects of foods on the brain or nervous system:

These psychological or neurological reactions can themselves be suggestion or adverse conditioning, on a psychological basis. There are also patients in whom genuine food sensitivity usually results in a pharmacological mechanism that affects the nervous system. (Ferguson, 1995).

1.4.Types of Food Intolerances

In the field of allergy, food allergy is one of the most controversial subjects. The lack of universal agreement on meanings and diagnostic criteria contributed to this growth. Because multiple adverse reactions to food do not affect the immune system, it is often better to use food allergy or food susceptibility. Table 1 brings together the various forms of food intolerance and allergy.

Table 1. Food allergy, intolerance and aversion

| |
|---|
| Group 1: Food allergy involving immunoglobulin E. Examples include immediate, sometimes violent, reactions to nuts, eggs, milk, fish and shellfish. |
| Group 2: Food allergy, not involving IgE, but where there is strong evidence that the immune system is altered. Examples are coeliac disease and cows' milk protein enteropathy. |
| Group 3: Non-allergic food intolerance reaction to foods affecting certain susceptible individuals. Examples include some types of irritable bowel syndrome, food-induced migraine, reactions to sulphites or nitrites, lack of digestive enzymes (hypolactasia, low aldehyde dehydrogenase) or other types of reaction (e.g. to tartrazine, red wines, cheeses). |
| Group 4: Established and well recognized intestinal diseases where the role of foods in causation is sometimes suspected but remains unproven. Examples include chronic ulcerative colitis and Crohn's disease. |
| Group 5: Food aversion, and subjects with non-specific symptoms to foods not confirmed by double-blind testing. |

- Lactose intolerance:

The most common way for individuals to develop symptoms with food is, perhaps, lactose intolerance (Lomer MCE, 2008). Lactose is a type of milk sugar and some dairy products including yogurt, ice cream and custard. The disaccharide becomes lactose. Despite absorption into two separate glucose molecules Lactose cannot be processed from the intestines into the bloodstream. The lining of the intestine creates an enzyme, lactase, that allows lactose to be digested. And, in adulthood, several individuals are unable to produce the enzyme. This characteristic is genetically determined and is common to several ethnic groups, including Aboriginal, Icelandic, Asian and Mediterranean.

Lactose remains undigested and therefore ingested by the small intestine in people who have neither minimal nor no lactase-enzyme made. Lactose sugars are transferred into the large intestine where intestinal bacteria multiply and generate gases. Sugar loads in the intestines can also osmose the fluid in the intestine. More gas and moisture in the intestines add to common lactose intolerance signs involving abdominal discomfort, flatulence, and diarrhoea in certain instances.

Although lactose intolerance is the most common way for milk to cause symptoms, other persons may develop symptoms of milk protein content, which may cause a broader range of symptoms.

- Wheat Intolerance:

The common staple diet- food wheat, which is identified as a symptom trigger. Coeliac disease is a route for the issue with food, when antibodies for gluten, wheat protein and associated grains are produced (Faulkner-Hogg K, 2009). Bloating and diarrhoea are common symptoms of coeliac disease, but other effects are encountered include exhaustion, vomiting and low iron rates. Since it can be important to exclude the consequences of the Coeliac Disease, before experimenting with wheat or gluten. Gluten may cause symptoms in some individuals even if

Coeliac Disease is omitted (Biesiekierski JR, 2011). Other components of wheat may also trigger symptoms including fructans.

- Fructose Intolerance:

Fructose is usually referred to as fruit sugar and is present in berries. While certain fruits are rich in fructose, certain fruits have more carbohydrates, including glucose, definitive vegetables and honey. Fructose may also be used as a sweetener in certain processed products. The amount of fructose absorbed by the genetic traits varies between the individuals also fructose is a single sugar or monosaccharide, so it does not have to be digested. If a person consumes more than can be consumed in the large intestine and is fermented by gut bacteria, the 'excess' of the fructose will be absorbed as well as the excess lactose sugars ferment, resulting in specific gut symptoms (Gibson PR N. E., 2007).

- FODMAPs:

A host of other carbohydrates can also be processed in the lower intestines. FODMAPs is an acronym of fermentable sugars (Gibson PR S. S., 2010) that may cause symptoms in certain people, and also known as fermentable carbohydrates. Signs are again triggered by dehydration as a response to the excess moisture and gas in the stomach, which ensures that the signs are mostly abdomen, bloating and pain effects. Diarrhoea sometimes can occur, but vice versa constipation will also occur.

Fructans are a long chain of fructose molecules in wheat and ointments, which can be contained in legumes as chickpea, breaded beans, and glass. Galactans are oligosaccharides. Humans do not have enzymes that convert them into individual carbohydrates, which implies that they are fermented in all. However, since not everyone experiences discommodity following these foods, the sensitivity of the gut, namely how much the intestines react to an increase in gases,

is an additional factor for the intolerance to food. The most that double sugar is lactose.

Monosaccharides — The most common single molecule sugar is fructose.

Polyols – Polyols are delimited in the fruit, particularly stone fruits but also in 'sugar free' confectionary, such as sorbitol, mannitol and xylitol, are generally used as sweetener. The contaminants of animals are not also digested, so intestinal bacteria may likely ferment.

- Food Additives:

A common cause for the symptoms of food intolerance is food additives (Swain A, 2009). Many products do not cause side effects, such as emulsifiers, fruits, lecithin and vitamins, to most individuals. Nevertheless, other food additives, including colour, preservatives and flavour enhancers, have been related to adverse food reactions. The UK study shows that the problem with food additives is 29% of 11 years old and 15% of 15 years old, but that additives in adults are smaller in the self-reported adverse reactions (Schafer, Bohler, Ruhdorfer & al, 2001). (Pereira, Venta, & Grundy, 2005).

The first diet that treated behavioural problems in children was the Feingold Diet, which in the early 1970s artificial colours of **Azo Dye**, became known for causing symptoms in susceptible individuals. Previously, a blend of artificial colours and one food preservative has been associated with increased behavioural problems in the UK-children eating the control diet compared to children eating the placebo (McCann D, 2007). Besides obviously colourful foods like cold drink and soft drinks, artificial colours, many consider healthy foods like juices. They may be added to foods.

Annatto (160b) has a natural yellow colour in which many dairy products such as ice cream, custards and yoghurts are added to make them appear even more fluffy. Although Annatto may be a natural colour and may have no added colouring, in some cases, such as urticaria and

gangliocytoma (Mikkelsen H, 1978) it can cause symptoms and is sometimes related to behavioural problems. It is also possible to cause symptoms.

Asthma can also induce a variety of other symptoms, including headaches and gut symptoms, in people who are susceptible to **sulphite preservatives (220-228)**. Most "good," products like dried fruit produce a few sulphites, and breakfast cereals, fruit snacks, sausages, creams and wines also include them. **Propionates (280-282)**, which are typically found in supermarket flour, are a different type of conservator. A 2002 Australian study showed that many children have behavioural signs exacerbated by the additive (Dengate S, 2002).

Nitrate (250) in addition to preserved foods, such as ham and bacon, **Benzoates (211)** in soft drinks and juice also in cosmetics, such as 'Parabens' and **Antioxidants (310-2; 319-21)**, which are used to avoid rancidity in oils include other known preservatives that cause symptoms in susceptible individuals. Not all conservants and antioxidants, such as **Vitamin E** and its variants **Tocopherols (306)**, are known to cause effects, must be remembered. Additionally, **Vitamin C**, salt or vinegar applied in products are known to cause effects.

MSG and similar compounds (**620-625**) also shown to trigger adverse reactions in sensitive individuals as well as other **flavour enhancers (627-635)**. The compounds are also often added in delicious foods, including potato chips, popular crackers and cookies and many products and sauces, to improve the flavour and appeal.

Naturally Occurring Food Chemical:

Caffeine is a naturally occurring chemical that may trigger symptoms such as rapid heartbeats or anxiety when consumed in larger quantities. Nevertheless, each person has a tolerance (threshold) for how much caffeine they may drink before symptoms occur. Salicylates are also a natural food additive that can cause symptoms in some patients. In some medications, such

as aspirin (acetyl-salicylic acid), high dose salicylates exist and, in many foodstuffs, smaller amounts occur.

The **salicylates** are a chemical product that plants produce to keep predators from consuming them as a natural protectant. The bulk of plant foods, such as nuts, beans, herbs and spices include salicylates (Swain A, 2009). A high level of salicylates can offer a food a sweet taste. Salicylates do not cause specific symptoms but hives and asthma are common symptoms (Hodge L, 1996).

Another category of food chemical, including **histamine and tyramine**, that occur naturally and are known to cause symptoms.

Amines can cause a variety of symptoms, including migraine and IBS. Amines exist as a by-product of protein breakdown and therefore are the strongest in aged and processed products such as the Citrus and chocolate (Swain A, 2009). Amines arise in the form of a by-product of protein breakdown.

Glutamate is another foodstuff which increases its influence with age. In strong cheese like parmesan and in Asian sauces, such as soy sauces and miso, glutamate is large. Throughout our tastes of vegetables like peppers, mushrooms and spinach, glutamates also exist naturally. While Glutamate has a low flavouring influence, it activates taste buds that are savoury so that other flavours taste better. Glutamates may induce a range of symptoms like migraines in susceptible individuals. MSG is a concentrated form of glutamate, which makes this product flavour-enhancing. (Carter, 1998).

1.5. The 14 Food Allergens Declared by the EU

There are 14 in total food available, which are mandatory to be labelled and highlighted on the packaging in the EU. All of them are declared by the EU scientific commission after rigorous research and considering most of the EU population.

Food ingredients that must be declared as allergens in the EU are as following:

1. **Cereals containing gluten**, namely: wheat (such as spelt and Khorasan wheat), rye, barley, oats or their hybridised strains, and products thereof, except:
 - (a) wheat based glucose syrups including dextrose
 - (b) wheat based maltodextrins
 - (c) glucose syrups based on barley
 - (d) cereals used for making alcoholic distillates including ethyl alcohol of agricultural origin

2. **Crustaceans** and products thereof

3. **Eggs** and products thereof

4. **Fish** and products thereof, except:
 - (a) fish gelatine used as carrier for vitamin or carotenoid preparations
 - (b) fish gelatine or Isinglass used as fining agent in beer and wine

5. **Peanuts** and products thereof

2. 6. **Soybeans** and products thereof, except:

(a) fully refined soybean oil and fat

(b) natural mixed tocopherols (E306), natural D-alpha tocopherol, natural D-alpha tocopherol acetate, and natural D-alpha tocopherol succinate from soybean sources

(c) vegetable oils derived phytosterols and phytosterol esters from soybean sources

(d) plant stanol ester produced from vegetable oil sterols from soybean sources

7. **Milk** and products thereof (including lactose), except:

(a) whey used for making alcoholic distillates including ethyl alcohol of agricultural origin

(b) lactitol

8. **Nuts**, namely: almonds (*Amygdalus communis* L.), hazelnuts (*Corylus avellana*), walnuts (*Juglans regia*), cashews (*Anacardium occidentale*), pecan nuts (*Carya illinoensis* (Wangenh.) K. Koch), Brazil nuts (*Bertholletia excelsa*), pistachio nuts (*Pistacia vera*), macadamia or Queensland nuts (*Macadamia ternifolia*), and products thereof, except for nuts used for making alcoholic distillates including ethyl alcohol of agricultural origin

9. **Celery** and products thereof

10. **Mustard** and products thereof

11. **Sesame seeds** and products thereof

12. **Sulphur dioxide and sulphites** at concentrations of more than 10 mg/kg or 10 mg/litre in terms of the total SO₂ which are to be calculated for products as proposed ready for consumption or as reconstituted according to the instructions of the manufacturers

13. **Lupin** and products thereof

14. **Molluscs** and products thereof

(FSAI, 2019)

1.6. 14 Food Allergen-Specific IgG Antibodies in Human Body

Food allergy involves an adverse response to products that are normally healthy for the human body that are encountered by some people. The pathogenesis of an antigenic compounds in the food requires an immuno-mediated response. Researchers have in recent allergy studies primarily focused on IgE mediated type I allergic reactions while IgG research is limited. In immediate and late phase reactions, IgE and IgG work respectively. While IgE is the primary antibody implicated in allergic reactions of type I, IgG is related to allergic reactions of type

III known as food intolerances. Correlative statistical analysis of food allergy symptoms in patients (Erlangen University Hospital in Germany) has shown that between 15 and 20 percent have not experienced immune-mediated IgE (i.e. food intolerance); Food intolerance is that and has become a global research subject.

Food-specific IgG are combined with food particles in order to form immuno complexes that cause inflammation of tissue, which manifest as symptoms and systemic diseases. Intolerant of foods is typically caused by several foods instead of single foods and can cause multi-system discomfort. Allergic to the eyes, like eczema, urticaria, purpura allergic and atopic dermatitis, and respiratory and gastrointestinal effects are linked to food allergies. In individuals of all ages, food intolerance can occur, but infants and children can be higher than adults. In a few hours to a few months following intake of the allergen, a range of signs caused by food intolerance usually appear.

Statistics show that up to 45% of people have certain food intolerance. Intolerance of food is triggered by the human immune system's over-protective reaction to one or more substances reaching the human body and developing diet-specific IgG antibodies. Therefore, it could be determined if specific antibodies of IgG are due to food intolerance to detect symptoms or diseases. Diverse people, including infants, may use an in vitro detection method for unique serum IgG antibodies.

The total positive rate for the 14 tested food allergen IgG antibodies was 99.9% (1298 out of 1299 children in total). The positive rates of the food allergen-specific IgG antibodies, listed from highest to lowest rate, were as follows: egg (84.1%, 1092), milk (79.8%, 1036), cod (48.7%, 633), soybean (28.3%, 367), crab (22.6%, 294), tomato (19%, 247), beef (15.5%, 201), rice (14.5%, 189), wheat (13.5%, 176), chicken (9.9%, 129), corn (8%, 104), shrimp (7.7%, 100), pork (4.8%, 63), and mushroom (3.7%, 48).

The 4 grades of the 14 food allergen IgG antibodies ($p < 0.05$) showed statistically important differences. The amounts of IgG antibody were rated from + 1 to + 3. The IgG antibodies for milk and egg allergens usually obtained + 2, whereas the other 12 IgG antibodies, allergens, were mostly rated at + 1.

For serum samples, 99.9% (853) were active IgG antibodies for boys and 100% girls (445) for food allergies. There was no statistically significant gender difference in the overall positive rate ($p > 0.05$). The positive rates were also significantly differentiated with respect to gender ($p > 0.05$) in each of the 14 food-allergen specific IgG antibodies.

For children 0–3 years of age, IgG antibody positive levels for meat, milk, chicken, pork and mushroom were greater than in people 4–11 years of age. In contrast, the positive rate of allergen specific IgG antibodies against the egg was lower for children aged 0 to 3 than for children aged 4 to 11. The statistically significant differences were those ($p < .05$). The differences between children of both age groups were not statistically significant for the positive rates of allergen specific IgG antibodies to cod, rice, maize, shrimp, crab, tomatoes, soybean and wheat ($p > 0.05$). (Zhou *et al.*, 2016) (Hofman, 1995).

1.7. Coeliac Disease

Coeliac disease is currently defined by the effects of gluten-free diet and gluten-free histology on small bowels and is probably due to activated T cells.

Coeliac disease is characterized as an enteropathy that is chronic and glutensensitive. The anatomy of the bowel mucosal biopsy is focused on the diagnosis. There are a very broad range of health events; in addition, half of recently diagnosed coeliac have no intestinal symptoms. The

diagnostic level should be minimal, however unfortunately even people with elevated symptoms will suffer for years before they get treatment.

Probably 50,000 people in the UK, half are undiagnosed with coeliac disease. Occasionally, gluten is a struggle to validate the condition but a dosage of 1020 g a day is required, normally at least 3 months, according to the allergy protocols.

Lactose is (default of the intestinal brush boundary enzyme lactase) by far the most popular cause of milk intolerance in most species, production of lactase declines dramatically after weaning, and in some breeds, lactase remains rare in adult life. In tiny bowels, the lactose tolerance check (blood glucose spike in the presence of lactose loads) and the non-invasive breath hydrogen test (NHCT) are necessary to determine lactase status (i.e. ability for lactose absorption or malabsorption). Upon drinking a glass of milk, approximately 50% of people with lactase deficiency may report bloating, wind or abdominal pain symptoms. In the UK, about 1 % of white people of European origin, and perhaps 30-50% of non-whites, are lactose intolerant to a greater or lesser degree. (Ferguson, 1995)

1.8. Symptoms of food allergy and food intolerances

Anxiety

Acne

Arthritis

Fatigue

Asthma

Migraine

Depression

Rhinitis

Eczema

Lethargy

| | |
|--------------------------|---|
| Sinusitis | Pre-menstrual symptoms |
| Bloating | Urticaria |
| Diarrhoea | Abdominal pains |
| Tension | Fluid retention |
| Rashes | Skin problems |
| Dizziness | Weight problems |
| Whizzing | Stomach cramps |
| Nausea | Autism |
| Itching | Aches and pains |
| Loss of appetite | Hyperactivity |
| Irritable bowel syndrome | Lethargic, bloated, tired – all the time |
| Psoriasis | Behavioural problems (especially in |
| Glue ear (Otitis media) | children) including tantrums oppositional |
| Constipation | defiance, ADHD etc. |
| Fibromyalgia | |

(Hodge, Swain, & Faulkner-Hogg, 2009).

1.9. What are the established dietary tolerances?

There is No proven valid food allergy (ASCIA) tests available. It can only be diagnosed by eliminating food from the diet. Meat intolerances can only be established by a suppressive lifestyle. It requires the elimination of classes of possible food stimuli, typically for 2-4 weeks, from the regular diet. in order to make sure the Diet is not nutritionally impaired, this

should be achieved under the supervision of the certified professional Dietitian (APD). A "challenge," a reintroduction of products in order to control the effect on the person, must be accompanied by an elimination diet if their symptoms return. Besides numerous types of food intolerances, various types of elimination diets are also used. (Carter, 1998)

1.10. Proposed Further studies/methods for managing Food Intolerances

To provide a quality medical care, an experienced and trained team of experts will be required to provide the necessary experience for the evaluation of diseases of many organ systems and assessments for individual patients. The doctors, dietitians and therapists and counsellors will all play important and distinct positions in regard to somatization conditions. The choice of not fuelling food sensitivity illusions by extensive and unnecessary testing of polysymptomatic patients is just as important and economical as the provision of a range of organic food sensitivity diagnostic procedures. Closer cooperation on product labels with the food industry is vital and multi-disciplinary work must be further encouraged into the complex and fascinating experiences between food, body and mind.

Food intolerance with the aid of professional health workers is essential. It is required. A specialist can, if needed, address medical problems such as coeliac disease or allergies. To order to ensure that the food is nutritionally adequate, any dietary restriction should be performed with the assistance of an Accredited Dieticians who can support. If a person is accused of food intolerance, a dietitian may help them examine the background of eating, consider the kinds of symptoms and foods that seem to cause symptoms and decide which type of diet can be effective in avoiding food. A ' low FODMAP ' diet is a typically eliminated

(Carter, 1998) diet and a 'low chemical elimination diet' is a diet low in natural food chemicals and additives.

1.11. The 93 Foods in-depth test which are available for food intolerances

Grains:

Barley

Buckwheat

Corn (maize)

Durum wheat

Millet

Oat

Rice

Rye

Wheat

Dairy:

Cow's milk

Egg white

Egg yolk

Goat's milk

Sheep's milk

Meats:

Beef

Chicken

Lamb

Pork

Turkey

Venison

Fish:

Cod

Crab

Herring

Mackerel

Mussies

Plaice

Prawns

Salmon

Sole

Trout

Tuna

Nuts:

Almond

Brazil nut

Cashew

Coconut

Hazelnut

Peanut

Walnut

Vegetables:

Aubergine

Avocado

Beetroot

Broccoli

Cabbage

Carrot

Cauliflower

Chicory

Celery

Cucumber

Haricot bean

Kidney bean

Leek

Lettuce

Mushroom

Onion

Pea

Peppers

Potato

Soybean

String bean

Sunflower seed

Tomato

Fruits:

Apple

Apricot

Banana

Black current

Grape

Grapefruit

Kiwi

Lemon

Melon

Olive

Orange

Peach

Pear

Pineapple

Plum

Strawberry

Spices/ Herbs:

Chilli pepper

Garlic

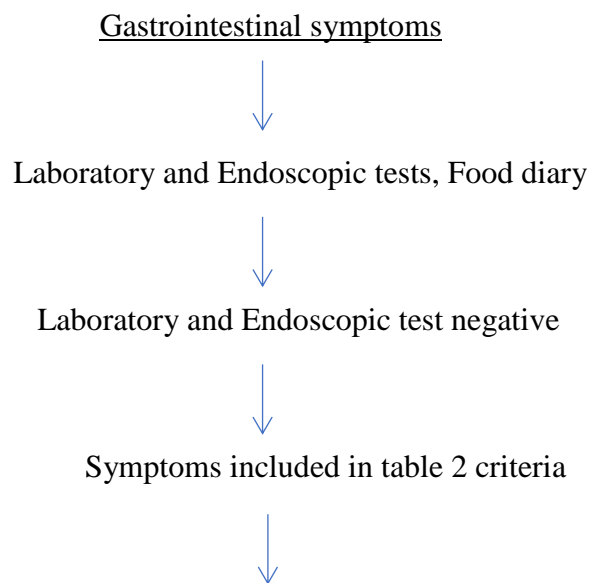
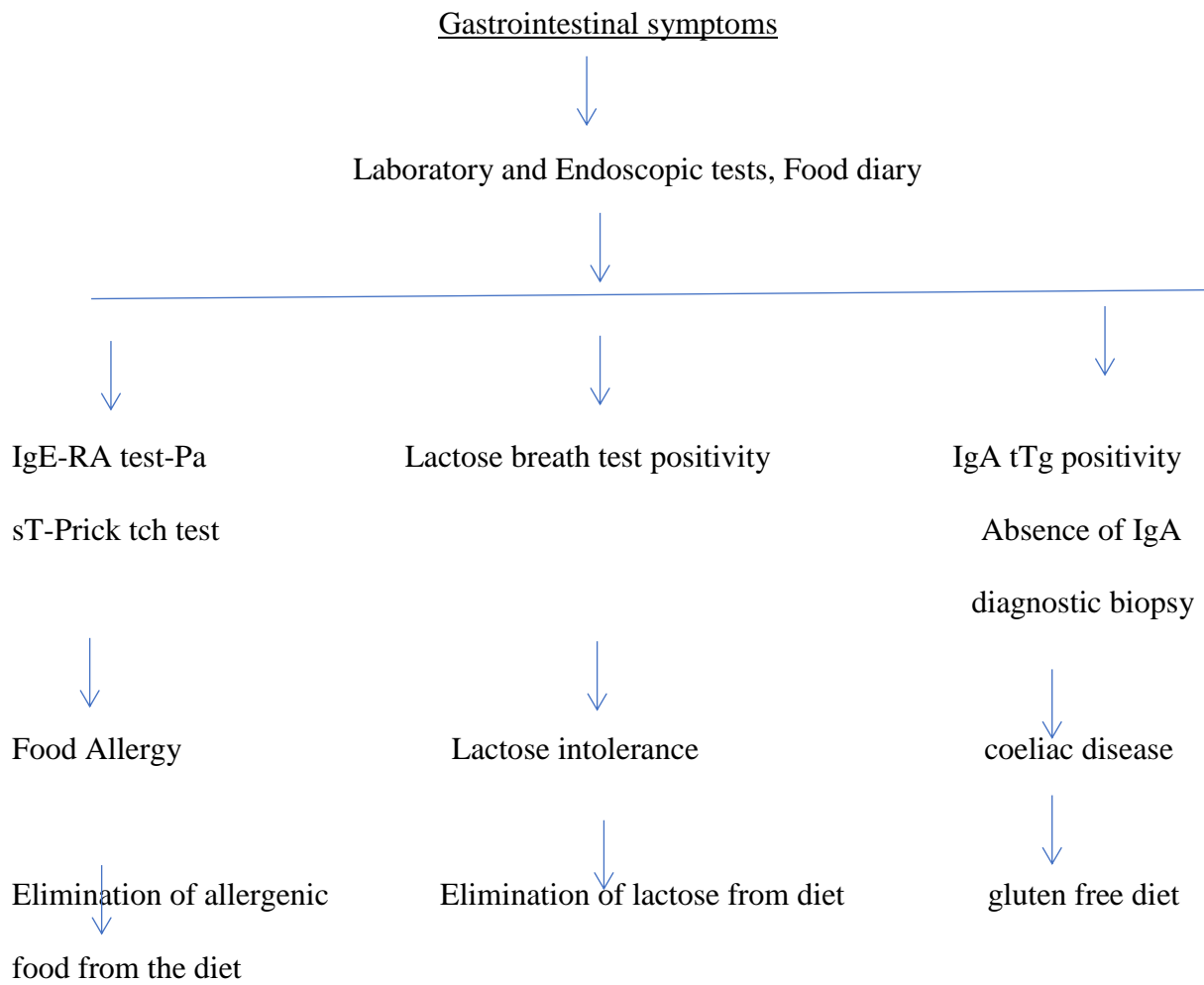
| | |
|---------------|------------------------------|
| Ginger | Carob |
| Mint | Cocoa bean |
| Nutmeg | Coffee |
| Peppercorn | Cola nut |
| Sesame seed | Rapeseed |
| Vanilla | Tea |
| <u>Other:</u> | Yeast (brewer's and baker's) |

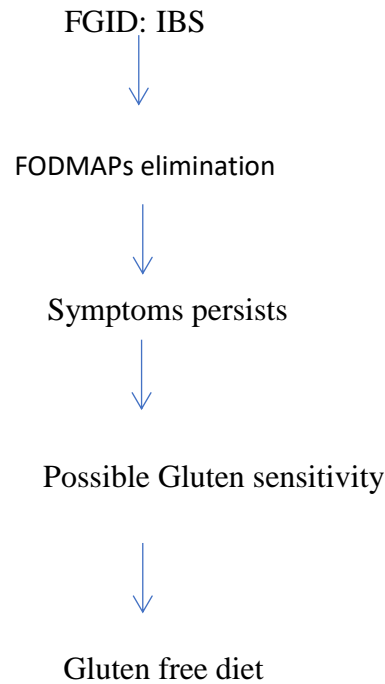
(‘Rene Red, "pin - prick " IgG ELISA delayed Food Allergy Essay)

1.12. Diagnostic - Therapeutic Protocol for Food Intolerance Management

A testing method can be recommended in patients with gastrointestinal symptoms, in line with available evidence, to classify diet adverse effects in this condition (Fig.1).

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





In order to monitor subsequent studies, the diagnostics / therapy procedure for the analysis of abnormal food reactions initially requires a thorough review of signals and the patient's safety and medical background. A step-by-step process needs to be followed in order to reach a conclusion and the plan may adjust based on a possible solution, except theories which do not contribute to a clinical validation.

The following **test** results must be followed up **to exclude food allergies**:

- 1) overall serum IgE: the association between the elevated IgE concentration and the risk of an individual having an adverse food reaction.
- 2) IgG: food-specific IgG monitoring usually shows some positive results, often a strong immune response. Nonetheless, unique IgG4 antibodies do not provide food allergy detection and IgG4 food monitoring in an allergy trial is not advised by national and international recommendations.
- 3) Food / serum-specific IgE RAST (radio allergic test) evaluates the presence of specific IgE antikoids in some food or substances in which they are contained. There is a direct correlation

between the diet-specific serum IgE concentrations and the risk of a person responding to a food taken in.

4) PRICK test: it is done using the skin with the uniform solution of specific proteins from food to determine its positivity. The positivity suggests that IgE is found in definitive foods.

Since serological patterns are negative in several cases while abdominal symptoms persist, different diagnostic methods were proposed but up to now no definite evidence is available for their accuracy. Cytotoxic procedures, challenge-neutralization, electrodermal diagnostics, modified kinesiological evaluations, and serum IgG or IgG4 tests are all experimental screening approaches for allergic-immunological disorders. Electrodermal examination, also called a VEGA test, is based on the false theory that the electrical resistance of the skin is affected by allergy. A food extract is put in contact with an aluminum plate on the circuit in a sealed glass vial which, in effect, contacts the skin of the patient. The electrical resistance of the skin is calculated by a galvanometer. An irritation or susceptibility to the allergen is demonstrated by a decrease of electromagnetic leakage or "disordered comprehension." The reproductivity of the method was poorly demonstrated in double-blind placebo-controlled diagnostic test accuracy studies. It could not also differentiate between atopically participants and non atopically, or allergens and negative controls, when it was detected. It was not successful.

Electrodermal testing (Vega), since it does not have a scientific foundation and therefore may result in inappropriate treatment, cannot be recommended for diagnosing food allergies, there is also no recommendation on the use of other diagnostic methods, since no evidence of diagnostic accuracy has been available.

In order to develop the best diagnostic test strategy, it is important for the physician to have some guidelines for the assessment of symptoms. The signs and effects, health condition and dietary background can be properly reviewed step-by-step. The appropriate laboratory tests and

patient history will affirm or exclude reactions or sensitivity, helping us to define, primarily in terms of dietary advice and the life style, the correct treatment method. (Pasqui *et al.*, 2015).

According to the role of the immune system in etiology of exposure to foodstuffs as well as the correlation of **Pulsed Electromagnetic Field Therapy** with beneficial immune shifts, it was believed that pulsed electric fields could have an advantage for the responsiveness of foodstuffs. The antigen leucocyte antibody assay was used to show the degree of food sensitivity in relation to the number of foods to which everyone responded in a small pilot sample of patients suffering from food sensibilities. It was found that the average amount of sensitive foods was reduced by 10.75 with one week of pulsed electromagnetic field therapy, which consisted of a 1-hour procedure per day, ($p < 0.05$). Feed sensitivities to the oral threats, including double-blind experiments, were recorded to be stable over time (Bock et al. 1978; May 1976; May and Bock, 1978). Also, it should be noted that the antigen leukocyte antibody test is not a standard test for food hypersensitivity. (Monro and Puri, 2015)

1.13. Anaphylaxis Shock

The most serious form of an allergic reaction is anaphylaxis, which is swift and potentially fatal. While it is predicted and seems that the incidence of anaphylaxis is 2 percent higher, the fatality rates (i.e. < 0.0001 percent in the general population or $< 0.5\%$ in those hospitalized or diagnosed with anaphylaxis in an emergency department) remain extremely low and seem to decline. (Fischer *et al.*, 2018)

Many episodes of anaphylaxis are caused by an immunological pathway involving immunoglobulin E (IgE) contributing to mast cell and basophilic activation and subsequent release of inflammatory mediators such as histamine, platelet stimulating agent, leukotrienes, tryptase and prostaglandins. Although any material can induce anaphylaxis, foodstuffs (especially peanuts, tree nuts, cow's milk, fish, eggs and weed), medications (most commonly penicillin and other antibiotics) and rotting insects are the most common causes of anaphylactic anaphylaxis induced by IgE.

The findings of skin tests and/or in vitro IgE tests can help the diagnosis for a specific cause of anaphylaxis. Different IgE antibodies may also be used for milk, medications (e.g. penicillin, penicillin), and stinging insects. Nevertheless, routine skin testing and/or in vitro procedures are not essential for the majority of drugs.

Anaphylaxis is a potential life-threatening situation in both children and adolescents. Its clinically complexed diagnosis and sudden occurrence without any prior notice makes the treatment even harder. The European Registry of Anaphylaxis stated that food, specifically hen's egg, milk of cow and nuts, was the major source of anaphylaxis in children. In young adulthood, insect venom reactions have been seen more. Admission to intensive care and IV / lethal reactions is uncommon. (Grabhenrich *et al.*, 2016)

A quick assessment of breathing and respiration and prompt application of epinephrine should continue the urgent treatment of anaphylaxis. Anaphylaxis drug Epinephrine should be used in any potential anaphylaxis patient instantly. Therapy should be given, although the treatment is unclear since epinephrine is not used contraindicated. (Fischer *et al.*, 2018). Epinephrine is prescribed as a dosage of 0.01 mg / kg (most 0.5 mg), intramuscularly administered every 5-15 minutes, if appropriate. For diagnosis and assessment all patients receiving epinephrine in emergency must be transferred

promptly (ideally by ambulance). To order to prevent or mitigate possible circulatory failure, patients will preferably be put in the recumbent posture (supine) unless the respiratory problem contraindicate it. Pregnant women should be positioned on the left side of the patient.

1.14. EpiPen and its Usage

The EpiPen injector is a single-use device used to treat severe allergic reactions e.g. anaphylaxis. EpiPen is inserted into patient's outer thigh's tissue or muscle. This can be distributed through clothes in an emergency.

How to use an EpiPen:

- Forms a fist with a black tip points down around the auto-injector. Disable the protection lock.
- Contract the fleshy part of the outer thigh with the black tip. You can inject your clothes straight away. Don't put your thumb on the unit's top. Holding the bee stable while you inject a kid or boy.
- Press the auto-injector firmly against the thigh with a quick movement. The spring-loaded needle is released, which injects the epinephrine dosage. Keep in place the auto-injector after activation for a few seconds.
- Disable the thigh's self-injector. Reinsert the needles used in the conveyor tube cautiously first. Tap the tube and bring it into the emergency room with you so that anyone you treat knows how much epinephrine you received.

After any use of epinephrine seek urgent medical attention. After 10 or 20 minutes, the effects of epinephrine can wear off. Further care and monitoring will be needed.

Only use an injector once and throw it away in a punch-proof bag. Hold it from children's and animals ' out of reach.(Grey and Cap)

All patients with previous anaphylaxis, including patients with a fast-comes systemic allergic reaction (gastrointestinal, respiratory, cardiac); diverting hives to food or insect sting; or rapid-reaction (e.g. minutes to hours) of any severity to the highest-risk foods such as peanut should be given a prescription for an epinephrine auto-injector.

For those weighing 30 kg or above the dosage of 0.30 mg and for adolescents measuring 15 to 30 kg should be used the dose of 0.15 mg. Several sources suggest that the 0.30 mg dosage be supplemented with 25 kg instead of 30 kg. These devices should be properly stored before the expiration date (avoiding extreme temperatures).

Section 2: METHODOLOGY

2.1. Introduction

- Methodology is the scientific formal, analytical study of studies methods. It involves a systematic analysis of the structure of the knowledge technology approaches and principles. This usually contains concepts like philosophy, theory, systems and quantitative or qualitative methods. (Irny and Rose, 2005) The remedy strategy is not the same as the method. The theoretical basis for the understanding of which procedures, method collections and best practices can be applied, for example an estimation of a particular result, is also provided.
- Research: the cycle of research has evolved as a result of man's desire to be attuned to his surroundings and to understand nature as well. Research is based on scientific reasoning; which could be inductive and deductive or both. Research is a mixture of knowledge and logic and can be said to be the most suitable way of discovering the facts, particularly in the natural sciences.
- Methodology of study: this is a compilation of standardized methods used in analysis. This simply means a guide to research and how it is done. This explains and analyzes approaches, sheds more light on their limits and tools, clarifies their conclusions and effects, and compares their potentialities to the twilight zone at the information borders.

2.2. Type of Research

The types of study may include an:

- Investigative study
- Intervention study
- Behavioural study
- Development study
- Characterisation study

These studies are based only on one party (intergroup design). Studies may wish to look at people's reactions or conduct before and after these process (e.g. training).

In this study quantitative and qualitative research was conducted combined as this dissertation provides literature for the food hypersensitivity and data analysis from the survey conducted.

2.2.1. Surveys

Surveys involve collecting information, usually from fairly large groups of people, by means of questionnaires but other techniques such as interviews or telephoning may also be used. Various types of surveys are available. The simplest method (the one-shoot survey) is offered at a certain point in time to a sample of people. Another type is the "before and after survey," completed by people before and after a major event or experience.

2.2.2. Questionnaires

Questionnaires are a good way to obtain information from a large number of people and/or people who may not have the time to attend an interview or take part in experiments. They enable people to take their time, think about it and come back to the questionnaire later. Participants can state their views or feelings privately without worrying about the possible reaction of the researcher. Questionnaires are a great way of obtaining input from a wide range of people who may not have time to participate in an interview or tests. You should take your time, discuss it and return to the questionnaire later. Without worrying about the researchers' possible reaction, participants may state their opinions or feelings in private. Many individuals might, sadly, still want to seek to provide socially acceptable responses. People should be encouraged to respond as honestly as possible questions in order to discourage researchers from drawing false assumptions.

Questions typically contains Multi-choice queries, attitudinal rates, closed questions, and open-ended topics. Studies do not always answer all questions or address them correctly since they typically have a fairly small response rate. Questionnaires may be administered in various ways (e.g. by mail or email attachments, posted on websites, personally distributed or delivered to prisoners, such as people participating in conferences). Investigators can even agree to perform the questionnaire in person with the benefit of people with reading and writing difficulties. In this situation, you may believe that you are interested in the conversation rather than conducting an interview because the interviewer must inform you on your behalf of the answers.

2.3. Methods used in study, Data Collection and Data Analyzation

This study is combination of quantitatively and qualitative research study. The study was conducted in Ireland – Republic of Ireland and Northern Ireland – among Early Years Services for children in age of 0 to 12 years old for prevalence of food hypersensitivity among them. Total of 980 questionnaires were distributed electronically via email to the childcare facilities and 11681 children in total has participated in this study.

- This project is a supporting study to a larger Safefood project examining the cost (monetary & quality of life) of living with a food hypersensitivity e.g. food allergy, food intolerance or coeliac disease.
- This project seeks to elucidate the prevalence of these food hypersensitivities, by gender, among young children attending early years' service.
- In addition, it will provide much needed information on the trigger foods, policies and practices in this environment.
- To the best of our knowledge there is currently no similar data on children attending crèches available in Ireland today. First study of it's kind in Ireland.
- This study will feed into the larger cross-border Safefood Food Allergen study; which will include recommendations on possible future interventions and suggested policy changes in this area.

The main aims and objectives of this study includes:

- Overall aim:

Investigate the prevalence of food hypersensitivity amongst children in the Early Years Services in Ireland

- Specific Objectives
 - ✓ Investigate the prevalence of food hypersensitivity amongst children in EYS
 - ✓ To generate datasets within the Early Years Services of children with food hypersensitivity in Ireland
 - ✓ Gender
 - ✓ Age
 - ✓ Type of food which causes hypersensitivity
 - Project Objectives include:
 - ✓ Current Food Allergen Management System within EYS
 - ✓ Training and management response of management within EYS
 - Response system
 - Emergency response procedures and staff training
 - ✓ Data from this research project will help in generating recommendations for Safefood report.
 - ✓ Data from this project can help in future government policies in same area.

2.3.1. Research Planning and Organizing

Following details are for the thesis generation throughout the degree course.

| |
|--|
| September 2018 – Research ideas and brainstorming for dissertation |
| February 27, 2019 – Submission of draft research proposal |
| March 1, 2019 – Thesis proposal submission to Dr. Ciara Walsh |

| |
|--|
| March 2, 2019 - Thesis Supervisor Allocated |
| April 3, 2019 – Project Meeting with Pr. Sara Boyd for thesis |
| April 2019 – Project meeting with Pr. Sara Boyd, Dr. Ciara Walsh, Miss Eliza Dimla |
| July 2, 2019 – Generated First draft survey in Survey Monkey |
| July 20, 2019 – Generation of Limescale survey |
| July 2019 – Cover Letter Generation and TU Dublin Ethic committee approval was obtained |
| August 2019 to October 2019- Survey distribution in Republic of Ireland and Northern Ireland |
| November 7, 2019 – Mid-term thesis progress presentation |
| May 2019 to November 2019 – Literature Review generation and compilation |
| November 27, 2011 – Accessed Datasets |
| November 29, 2011 – Stopped Survey Distribution and compiled the datasets |
| December 10, 2019 – Results Generation |
| December 15, 2019 –Dissertation compilation and research article writing |
| January 2, 2020 – Thesis Editing |
| January 6, 2020 – Thesis Submission |

2.3.2. Literature Review Writing and Survey Generation

Immense amount of research articles, journal articles, medical journals and books related to food allergens, food allergy, food hypersensitivity, food intolerances, Coeliac disease was referred. With the help of internet, google scholar, Tu Dublin online library, Mendeley (software for writing research or articles) mountain of literature was managed and compiled.

In order to generate survey as well immense amount of literature was reviewed.

For survey compilation, brain storming ideas and questionnaire including questions to fulfil survey objectives and to get information regarding EYS various surveys from online platforms and articles regarding survey conduction and survey generation were revised.

Initially, survey monkey – an online platform to generate, distribute and analyse datasets was considered. But limited features, cost effectiveness, limitation in form of survey accessibility for various population range urged Limescale Survey platform to be the final choice.

After careful compilation of questions which addresses various demographic and data related query which are open – ended, closed ended or expressive with respect to further data needed a survey was generated and was ready to be distributed by mid- July 2019.

Along with the survey a cover letter was also attached, which contains preamble of research and privacy statements also how the data will be managed once obtained from surveys and contact information in case of any query along with mentioning of Safefood project etc.

The Survey was sent to the TU Dublin ethics committee to be approved and was flagged green to be used for research.

During literature review generation and before putting together survey, it was decided that only registered EYS with Department of Education will be used.

After getting name, addresses and phone number of all the registered EYSs, obtaining their email addresses was a biggest challenge as it was not available on either TUSLA (a government

approved agency for childcare in Republic of Ireland). Hence, they were individually searched online, and their email addresses were derived.

From the gov.uk for Northern Ireland site, email addresses of registered EYSs were obtained. Further then, with all the emerged email addresses and necessary approvals, surveys were distributed among childcare facilities via email.

After Compiling all the datasets obtained, data was analysed in order to generate results required i.e. Food Intolerances in children from 0 to 12 years age and triggered food for it, their age, gender, food safety management polices followed in the premises, knowledge among childcare providers regarding food allergen and their vital effects upon children.

2.4. Cover Letter for Island of Ireland

Cover letter including information about survey and privacy policy was attached along with the survey which is as follows:

We are requesting your assistance with a study that is currently being conducted by the Technological University Dublin (formerly DIT) in Ireland, as part of a bigger Safefood project. Our survey contains questions on allergen management, and queries regarding food hypersensitivity in your facility.

More specifically, we are looking for the following anonymised information on children with food allergies, coeliac disease & food intolerances under your care:

- age & gender
- associated trigger foods (if food allergic or intolerant)
- availability of EpiPen (if food allergic individuals)

This information will greatly assist us in determining the prevalence (and possible future

recommendations) of food allergies, coeliac disease and food intolerances in children in Ireland today.

This survey consists of 13 questions and will take approximately 10 minutes to complete. It is anonymous and cannot be traced back to any computer IP address. The information from this questionnaire will be stored electronically on a password-protected encrypted computer at TU Dublin for a maximum time of 5 years before being electronically deleted. To learn more, please visit:

<https://www.dit.ie/media/instituteofsecretary/dataprotection/Data-Protection-and-Privacy-Policy-v1.pdf>

Thank you in advance for assisting us with this study.

For further information about the study, please contact:

Miss Ruta Patel

MSc Student

Technological University Dublin

E-mail address: d17129099@mytudublin.ie

2.5. Safefood - Food Hypersensitivity Questionnaires

2.5.1. Food Hypersensitivity Questionnaire for the Early Years' Service in the Republic of Ireland

There are 13 questions in this survey.

Please answer all the questions and complete the following survey as best as you can.

1. Please select the county where your early years facility is located.

Please choose only one of the following:

- Carlow
- Cavan
- Clare
- Cork
- Donegal
- Dublin
- Galway
- Kerry
- Kildare
- Kilkenny
- Laois
- Leitrim
- Limerick
- Longford
- Louth
- Mayo
- Meath
- Monaghan
- Offaly
- Roscommon
- Sligo
- Tipperary
- Waterford

- Westmeath
- Wexford
- Wicklow

2. What type of early years' service do you provide?

Please choose all that apply:

- Childminding Services
- Sessional Pre-School Service
- Part-time Day Care Service
- Full Day Care Service
- Pre-School Service in a Drop-in Centre
- Temporary Pre-School Service
- Overnight Pre-School Service
- Other:

3. How many children in the 0 to 12 years old age group are in your facility?

Only numbers may be entered in this field. Please write your answer here:

4. What is the gender breakdown of the 0 to 12 years old age group in your facility?

Only numbers may be entered in these fields. Please write your answer(s) here:

Male

Female

5. How many children have food hypersensitivities (e.g. food allergies, coeliac disease and food intolerances) within your facility? Please see definitions below and enter '0' if you are unaware of any child having a condition.

Only numbers may be entered in these fields. Please write your answer(s) here:

No. of children with Food Allergies

No. of children with Coeliac Disease

No. of children with Food Intolerances

Food hypersensitivities refers to food allergies, coeliac disease and food intolerances.

A food allergy is when the immune system generates an adverse reaction to specific proteins found in food. If the reaction is severe, this is an anaphylactic reaction (anaphylaxis) which is life threatening.

Symptoms of a food allergy:

- itching or swelling in the mouth and throat
- hives anywhere on the body
- runny nose and eyes
- reddening of the skin
- feeling sick
- diarrhoea and/or vomiting
- a sudden feeling of weakness
- breathing problems

- Coeliac disease is caused by an intolerance to gluten. Coeliac disease is an auto-immune disease, which means that the body's immune system attacks itself. When gluten is eaten, this results in damage to the lining of the small intestine, which stops the body properly absorbing nutrients. Gluten is the general name of the proteins found in wheat, rye, and barley and other grains derived from them. Some people with coeliac disease finds that eating oats can also trigger their symptoms.

The symptoms of coeliac disease can range from very mild to severe, including:

- diarrhoea
- bloating
- abdominal pain
- weight loss
- failure to grow at the expected rate
- malnutrition

A food intolerance means either the body cannot properly digest the food that is eaten, or that a food might irritate the digestive system.

Symptoms of a food intolerance:

- diarrhoea
- bloating
- upset stomach
- nausea
- gas
- cramps
- abdominal pain
- irritability

- nervousness
- headaches

6. Please complete the table for each child with a food hypersensitivity to the best of your knowledge. Where you are unaware of a child having a particular condition e.g. coeliac disease please mark your answer as 'No'.

| | 1. Gender (Male or Female) | 2. Age (0-12 years) | 3. Do they have a food allergy? (Yes, No or Unsure) If No, please skip (right no.7) | 4. Are there any food allergies? Medically diagnosed? (Yes, No or Unsure) | 5. Please list all the foods which triggers allergy | 6. Do they have an Epi pen? (Yes, No or Don't know) | 7. Do they have coeliac disease? (Yes, No or Unsure) | 8. Do they have any food intolerances? (Yes, No or Unsure) | 9. Please list food Intolerance trigger foods |
|---------|-------------------------------|------------------------|---|---|---|--|---|---|---|
| Child 1 | | | | | | | | | |
| Child 2 | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| Child 3 | | | | | | | | | |
| Child 4 | | | | | | | | | |
| Child 5 | | | | | | | | | |
| Child 6 | | | | | | | | | |
| Child 7 | | | | | | | | | |
| Child 8 | | | | | | | | | |
| Child 9 | | | | | | | | | |
| Child 10 | | | | | | | | | |
| Child 11 | | | | | | | | | |
| Child 12 | | | | | | | | | |
| Child 13 | | | | | | | | | |
| Child 14 | | | | | | | | | |
| Child | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| 15 | | | | | | | | | |
| Child 16 | | | | | | | | | |
| Child 17 | | | | | | | | | |
| Child 18 | | | | | | | | | |
| Child 19 | | | | | | | | | |
| Child 20 | | | | | | | | | |
| Child 21 | | | | | | | | | |
| Child 22 | | | | | | | | | |
| Child 23 | | | | | | | | | |
| Child 24 | | | | | | | | | |
| Child 25 | | | | | | | | | |
| Child 26 | | | | | | | | | |
| Child 27 | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| Child 28 | | | | | | | | | |
| Child 29 | | | | | | | | | |
| Child 30 | | | | | | | | | |
| Child 31 | | | | | | | | | |
| Child 32 | | | | | | | | | |
| Child 33 | | | | | | | | | |
| Child 34 | | | | | | | | | |

7. Do you have any, or more than one, of the following in place?

Please choose all that apply:

- Written food allergy policy
- Peanut/Nut ban policy on site
- No food sharing policy
- Ban of specific food allergen/s in your facility
- Allergen Management Plan for allergic individuals
- Emergency plan in place to manage anaphylaxis
- None of the above

✓ Don't know

✓ Other:

8. What are your current food preparation arrangements on-site?

Please choose all that apply:

✓ We prepare meals on-site

✓ Children can bring in their own food

✓ We provide pre-prepared meals (food prepared off-site)

✓ Other:

9. Have you had an incident of an adverse reaction to food on site in the last 12 months?

Please feel free to elaborate on any of the statements.

Please choose all that apply and provide a comment:

Yes

Yes, we had to use EpiPen

Yes, more than one incident. If more than one, how many in total?

None

None, in the last 12 months but previously

Don't know

Other:

10. If you prepare food on-site, has any staff member received any food allergen training as part of their food safety training? *

Please choose only one of the following:

- Yes
- No
- Don't know
- We don't prepare food on-site

11. If you prepare food on-site, is allergen management part of your food safety management plan within your kitchen or food preparation area? *

Please choose only one of the following:

- Yes
- No
- Don't know
- We don't prepare food on-site

12. Is anyone on-site trained to use an EpiPen (adrenaline auto-injector), or would like to be trained to use one? *

- Please choose all that apply:
- We have a trained staff member

- We have a trained staff member, but would like to have more individuals trained
- We have no trained staff member
- We have no trained staff member, but would like to have individuals trained

13. Please feel free to write suggestions or recommendations you believe would assist in improving the quality of life of children with food allergies, coeliac disease and food intolerances in the Republic of Ireland today.

2.5.2. Food Hypersensitivity Questionnaire for the Early Years’ Service in Northern Ireland

There are 13 questions in this survey.

Please answer all the questions and complete the following survey as best as you can.

1. Please select the county where your early years facility is located.

Please choose only one of the following:

- Antrim
- Armagh
- Down
- Fermanagh
- Londonderry
- Tyrone

2. What type of early years' service do you provide?

Please choose all that apply:

- Childminding Services
- Sessional Pre-School Service
- Part-time Day Care Service
- Full Day Care Service
- Pre-School Service in a Drop-in Centre
- Temporary Pre-School Service
- Overnight Pre-School Service
- Other:

3. How many children in the 0 to 12 years old age group are in your facility?

Only numbers may be entered in this field. Please write your answer here:

4. What is the gender breakdown of the 0 to 12-year-old age group in your facility?

Only numbers may be entered in these fields. Please write your answer(s) here:

Male

Female

5. How many children have food hypersensitivities (e.g. food allergies, coeliac disease and food intolerances) within your facility? Please see definitions below and enter '0' if you are unaware of any child having a condition.

Only numbers may be entered in these fields. Please write your answer(s) here:

No. of children with Food Allergies

No. of children with Coeliac Disease

No. of children with Food Intolerances

Food hypersensitivities refers to food allergies, coeliac disease and food intolerances.

A food allergy is when the immune system generates an adverse reaction to specific proteins found in food. If the reaction is severe, this is an anaphylactic reaction (anaphylaxis) which is life threatening.

Symptoms of a food allergy:

- itching or swelling in the mouth and throat
- hives anywhere on the body
- runny nose and eyes
- reddening of the skin
- feeling sick
- diarrhoea and/or vomiting
- a sudden feeling of weakness
- breathing problems

- Coeliac disease is caused by an intolerance to gluten. Coeliac disease is an auto-immune disease, which means that the body's immune system attacks itself. When gluten is eaten, this results in damage to the lining of the small intestine, which stops the body properly absorbing nutrients. Gluten is the general name of the proteins found in wheat, rye, and barley and other grains derived from them. Some people with coeliac disease finds that eating oats can also trigger their symptoms.

The symptoms of coeliac disease can range from very mild to severe, including:

- diarrhoea
- bloating
- abdominal pain
- weight loss
- failure to grow at the expected rate
- malnutrition

A food intolerance means either the body cannot properly digest the food that is eaten, or that a food might irritate the digestive system.

Symptoms of a food intolerance:

- diarrhoea
- bloating
- upset stomach
- nausea
- gas
- cramps
- abdominal pain
- irritability

- nervousness
- headaches

6. Please complete the table for each child with a food hypersensitivity to the best of your knowledge. Where you are unaware of a child having a condition e.g. coeliac disease please mark your answer as ‘No’.

| | 1. Gen-der (Male or Fe-male) | 2. Age (0-12 years) | 3. Do they have a food allergy? (Yes, No or Unsure) If No, please skip (right no.7) | 4. Are the food alle-rgies medi-cally dia-gnosed? (Yes, No or Un-sure) | 5. Please list all the foods which triggers allergy | 6. Do they have an Epi-pen? (Yes, No or Don't know) | 7. Do they have coeliac disease? (Yes, No or Unsure) | 8. Do they have any food intolerance-ances? (Yes, No or Unsure) | 9. Please list food Intole-rance tri-gger foods |
|---------|------------------------------|---------------------|---|--|---|---|--|---|---|
| Child 1 | | | | | | | | | |
| Child 2 | | | | | | | | | |
| Child | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| 3 | | | | | | | | | |
| Child 4 | | | | | | | | | |
| Child 5 | | | | | | | | | |
| Child 6 | | | | | | | | | |
| Child 7 | | | | | | | | | |
| Child 8 | | | | | | | | | |
| Child 9 | | | | | | | | | |
| Child 10 | | | | | | | | | |
| Child 11 | | | | | | | | | |
| Child 12 | | | | | | | | | |
| Child 13 | | | | | | | | | |
| Child 14 | | | | | | | | | |
| Child 15 | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| Child 16 | | | | | | | | | |
| Child 17 | | | | | | | | | |
| Child 18 | | | | | | | | | |
| Child 19 | | | | | | | | | |
| Child 20 | | | | | | | | | |
| Child 21 | | | | | | | | | |
| Child 22 | | | | | | | | | |
| Child 23 | | | | | | | | | |
| Child 24 | | | | | | | | | |
| Child 25 | | | | | | | | | |
| Child 26 | | | | | | | | | |
| Child 27 | | | | | | | | | |
| Child | | | | | | | | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|
| 28 | | | | | | | | | |
| Child 29 | | | | | | | | | |
| Child 30 | | | | | | | | | |
| Child 31 | | | | | | | | | |
| Child 32 | | | | | | | | | |
| Child 33 | | | | | | | | | |
| Child 34 | | | | | | | | | |

7. Do you have any, or more than one, of the following in place?

Please choose all that apply:

- Written food allergy policy
- Peanut/Nut ban policy on site
- No food sharing policy
- Ban of specific food allergen/s in your facility
- Allergen Management Plan for allergic individuals
- Emergency plan in place to manage anaphylaxis
- None of the above
- Don't know

✓ Other:

8. What are your current food preparation arrangements on-site?

Please choose all that apply:

- ✓ We prepare meals on-site
- ✓ Children can bring in their own food
- ✓ We provide pre-prepared meals (food prepared off-site)

✓ Other:

9. Have you had an incident of an adverse reaction to food on site in the last 12 months?

Please feel free to elaborate on any of the statements.

Please choose all that apply and provide a comment:

Yes

Yes, we had to use EpiPen

Yes, more than one incident. If more than one, how many in total?

None

None, in the last 12 months but previously

Don't know

Other:

10. If you prepare food on-site, has any staff member received any food allergen training as part of their food safety training? *

Please choose only one of the following:

- Yes
- No
- Don't know
- We don't prepare food on-site

11. If you prepare food on-site, is allergen management part of your food safety management plan within your kitchen or food preparation area? *

Please choose only one of the following:

- Yes
- No
- Don't know
- We don't prepare food on-site

12. Is anyone on-site trained to use an EpiPen (adrenaline auto-injector), or would like to be trained to use one? *

- Please choose all that apply:
- We have a trained staff member
- We have a trained staff member, but would like to have more individuals trained

- We have no trained staff member
- We have no trained staff member, but would like to have individuals trained

13. Please feel free to write suggestions or recommendations you believe would assist in improving the quality of life of children with food allergies, coeliac disease and food intolerances in the Northern Ireland today

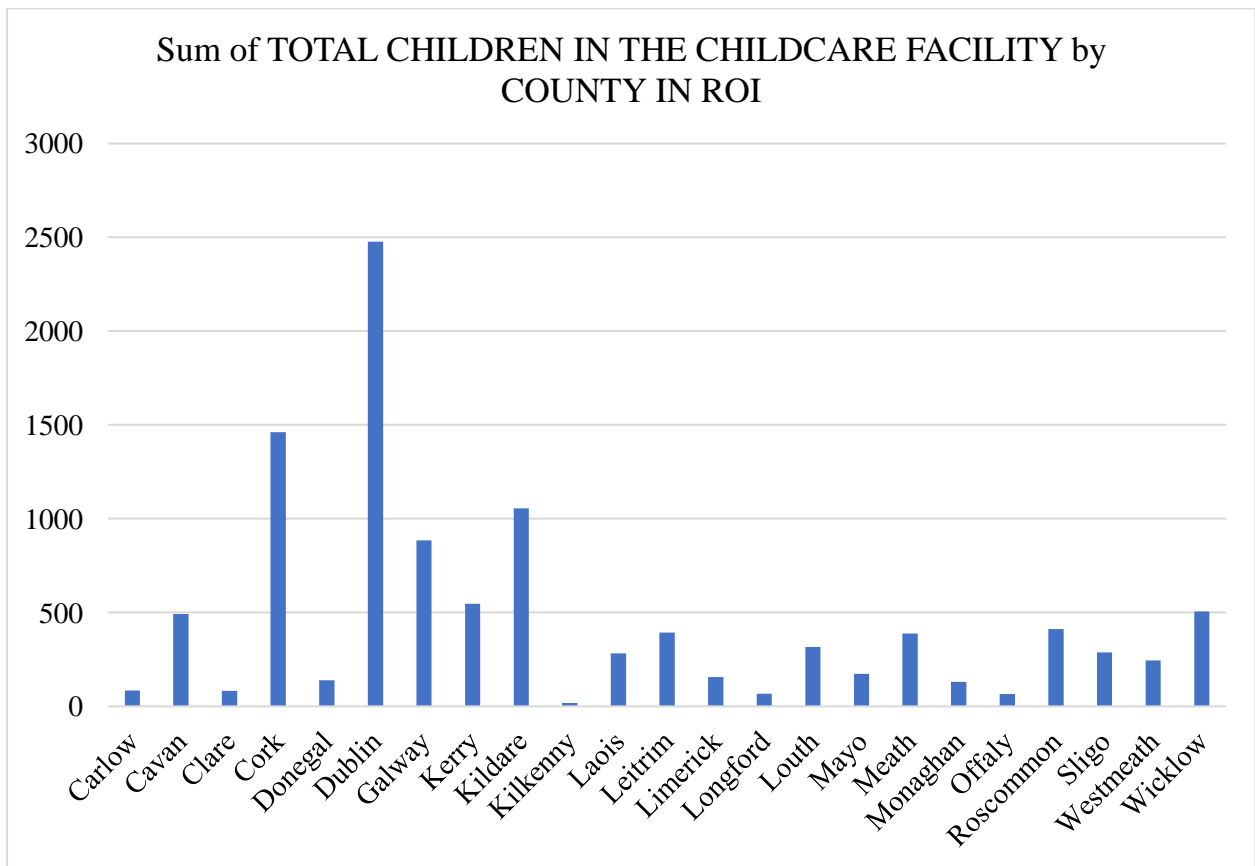
Section 3: RESULTS

All the results were compiled from the limescale survey and processed accordingly to their necessity. All the responses are considered including complete responses and incomplete responses for each and every question and both countries as incomplete responses were in terms of not answered to comments from childcare facilities, any elaboration or further discussion for the allergen policy or allergen management which can be ignored in this research as the main aim and focus is to get number or percentages of children – within 0 to 12 years old and are in childcare facilities – within Island of Ireland.

- Total Survey Distributed in
ROI- 800
NI- 180
TOTAL- 980
- Total survey responses received in
ROI- 192 (24%)
NI- 19 (10.55%)
TOTAL- 211 (21.53%)
- Total average time required to complete the survey in
Avg. 14.89 minutes – NI
Avg. 9.22 minute – ROI

All the results are compiled and presented in the form of charts according to their characteristics and value variations as depicted below. Also, numbers and figures (statistics) are provided for better understanding:

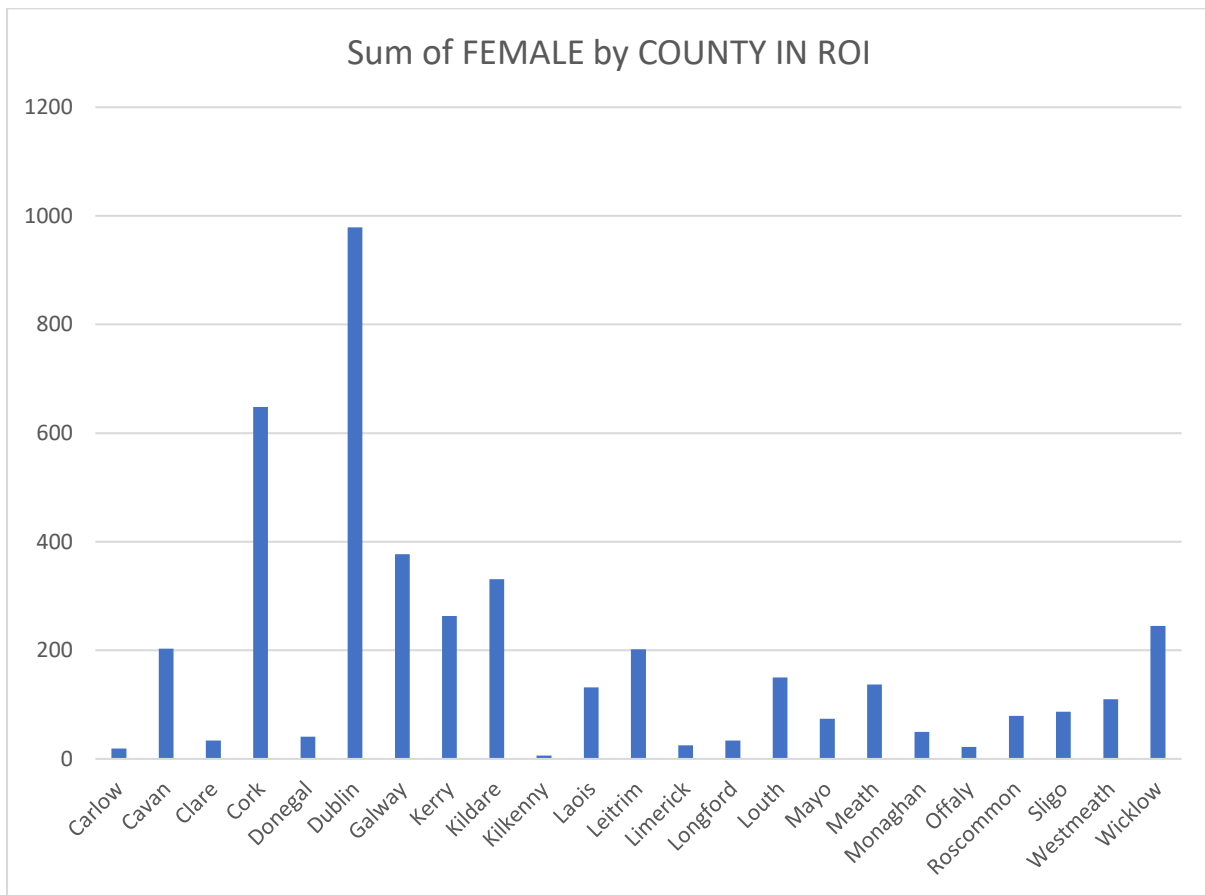
Chart 4.1. Total Number of Children under age of (0 to 12 years) distribution in Childcare facility in ROI county wise



| COUNTY | Sum of TOTAL CHILDREN IN THE CHILDCARE FACILITY |
|---------|---|
| Carlow | 84 |
| Cavan | 492 |
| Clare | 82 |
| Cork | 1461 |
| Donegal | 139 |
| Dublin | 2477 |
| Galway | 884 |
| Kerry | 546 |

| | |
|-----------|------|
| Kildare | 1056 |
| Kilkenny | 18 |
| Laois | 283 |
| Leitrim | 394 |
| Limerick | 156 |
| Longford | 68 |
| Louth | 316 |
| Mayo | 173 |
| Meath | 388 |
| Monaghan | 130 |
| Offaly | 66 |
| Roscommon | 412 |
| Sligo | 288 |
| Westmeath | 245 |
| Wicklow | 505 |

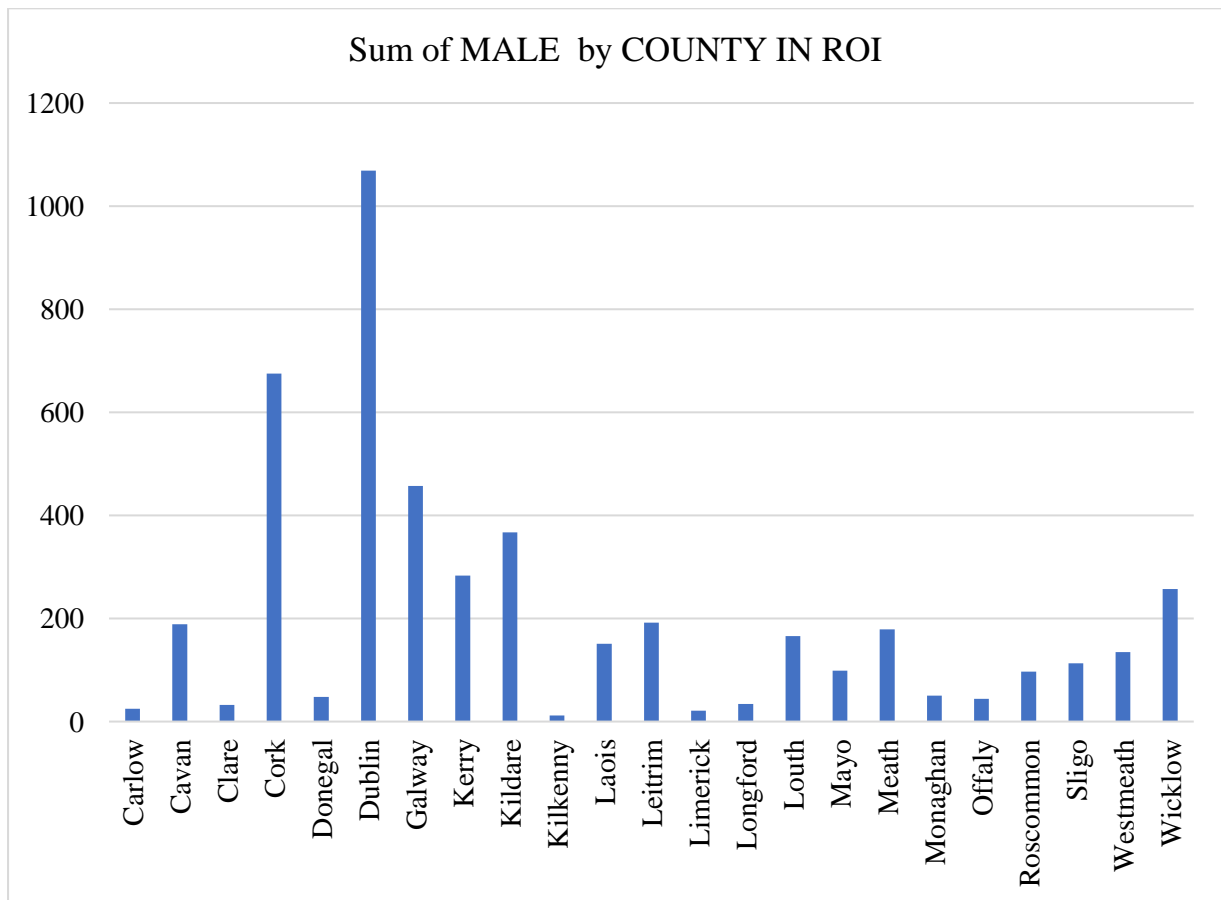
Chart 4.2. Total number of female children under age of 0 to 12 years in ROI county wise



| COUNTY | Sum of FEMALE |
|---------|---------------|
| Carlow | 19 |
| Cavan | 203 |
| Clare | 34 |
| Cork | 648 |
| Donegal | 41 |
| Dublin | 979 |
| Galway | 377 |

| | |
|-----------|-----|
| Kerry | 263 |
| Kildare | 331 |
| Kilkenny | 6 |
| Laois | 132 |
| Leitrim | 202 |
| Limerick | 25 |
| Longford | 34 |
| Louth | 150 |
| Mayo | 74 |
| Meath | 137 |
| Monaghan | 50 |
| Offaly | 22 |
| Roscommon | 79 |
| Sligo | 87 |
| Westmeath | 110 |
| Wicklow | 245 |

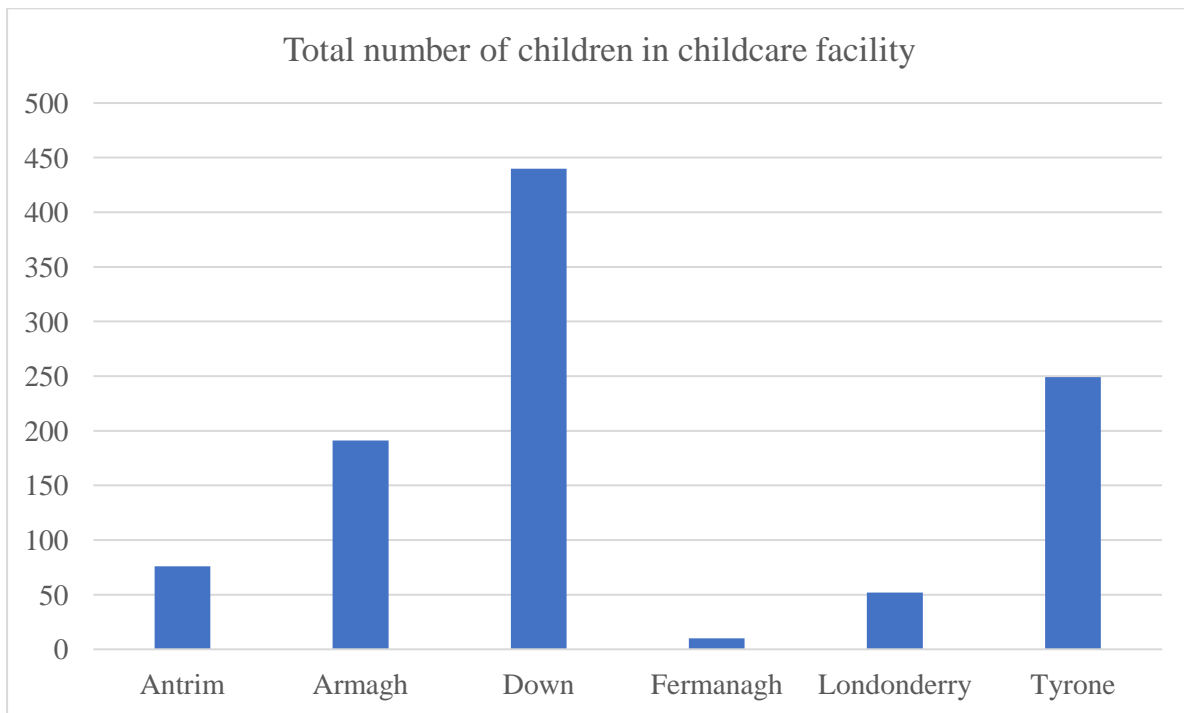
Chart 4.3. Total number of male children under age of 0 to 12 years in ROI county wise



| COUNTY | Sum of MALE |
|---------|-------------|
| Carlow | 25 |
| Cavan | 189 |
| Clare | 32 |
| Cork | 675 |
| Donegal | 48 |
| Dublin | 1069 |
| Galway | 457 |
| Kerry | 283 |

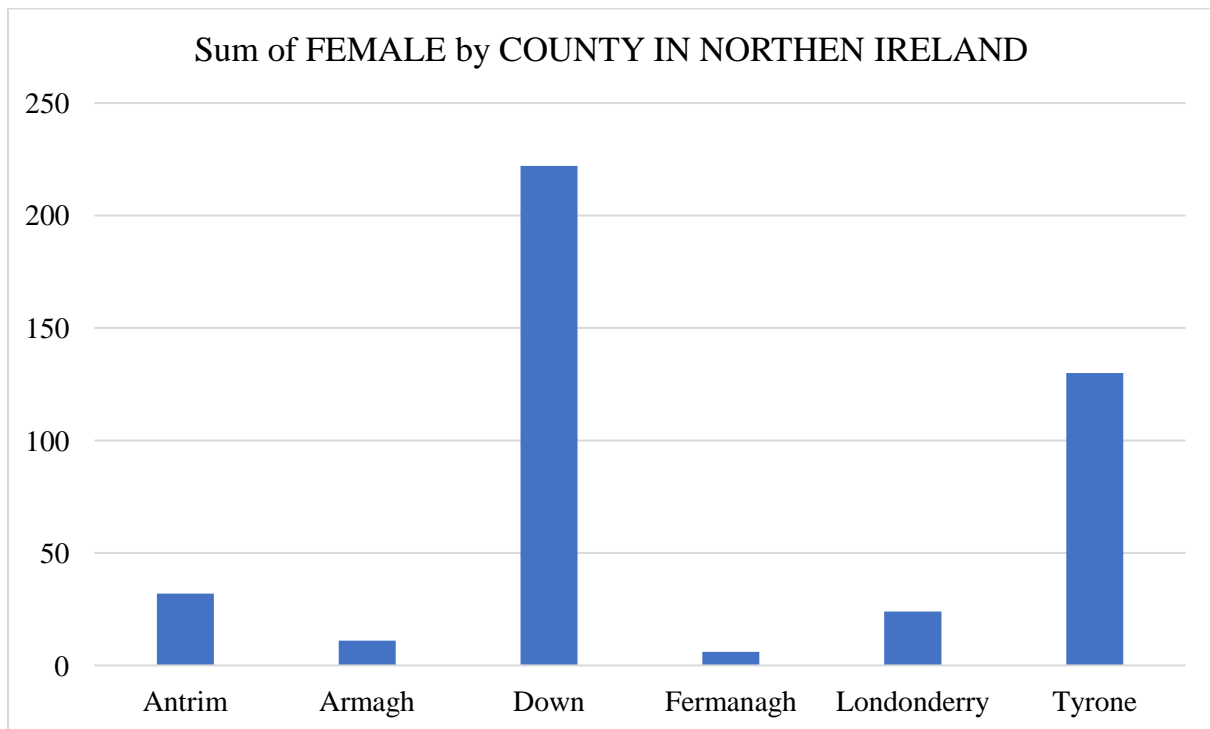
| | |
|-----------|-----|
| Kildare | 367 |
| Kilkenny | 12 |
| Laois | 151 |
| Leitrim | 192 |
| Limerick | 21 |
| Longford | 34 |
| Louth | 166 |
| Mayo | 99 |
| Meath | 179 |
| Monaghan | 50 |
| Offaly | 44 |
| Roscommon | 97 |
| Sligo | 113 |
| Westmeath | 135 |
| Wicklow | 257 |

Chart 4.4. Total number of children under age of 0 to 12 years in NI county wise



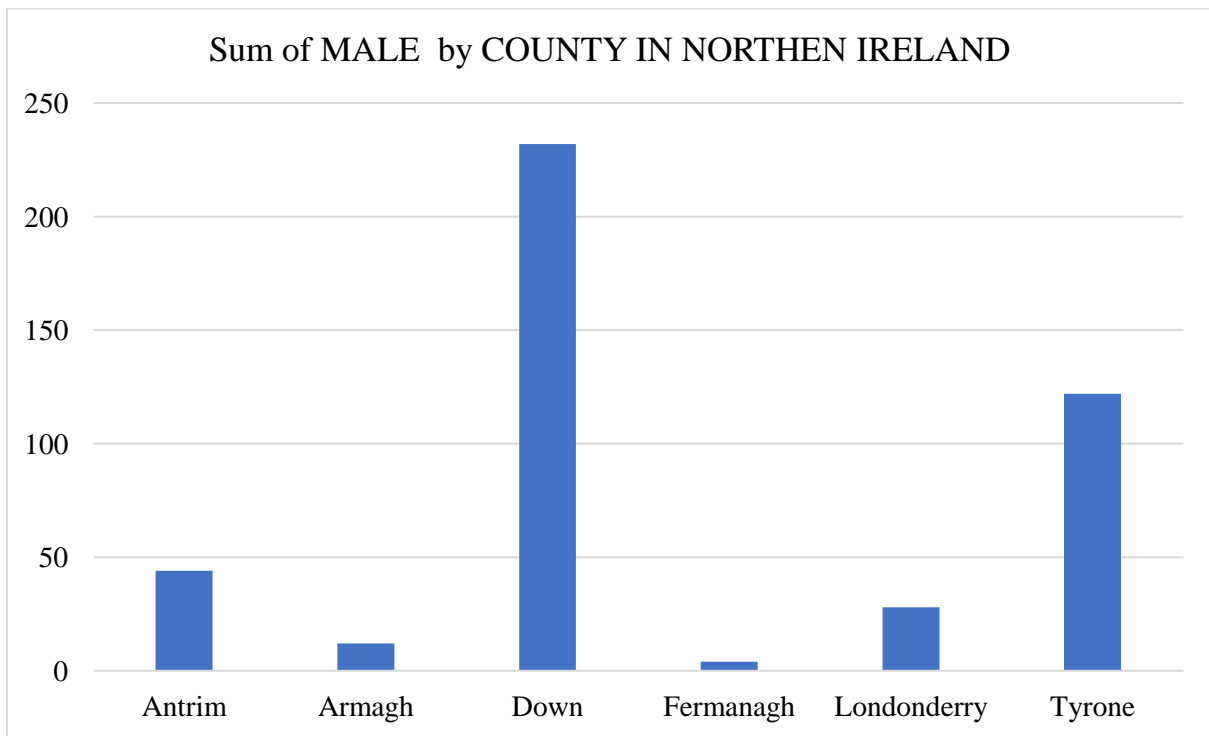
| County of Northern Ireland | Total number of children in childcare facility |
|----------------------------|--|
| Antrim | 76 |
| Armagh | 191 |
| Down | 440 |
| Fermanagh | 10 |
| Londonderry | 52 |
| Tyrone | 249 |

Chart 4.5. Total number of female children under age of 0 to 12 years in NI county wise



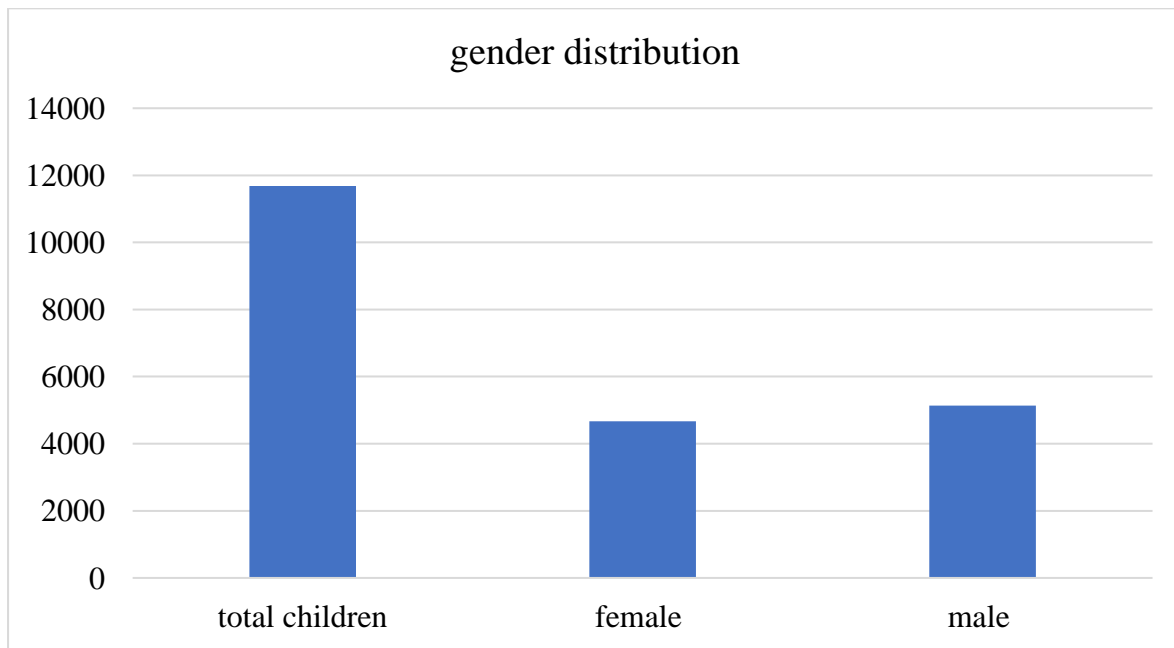
| County Of Northern Ireland | Sum Of Female |
|----------------------------|---------------|
| Antrim | 32 |
| Armagh | 11 |
| Down | 222 |
| Fermanagh | 6 |
| Londonderry | 24 |
| Tyrone | 130 |

Chart 4.6. Total number of male children under age of 0 to 12 years in NI county wise



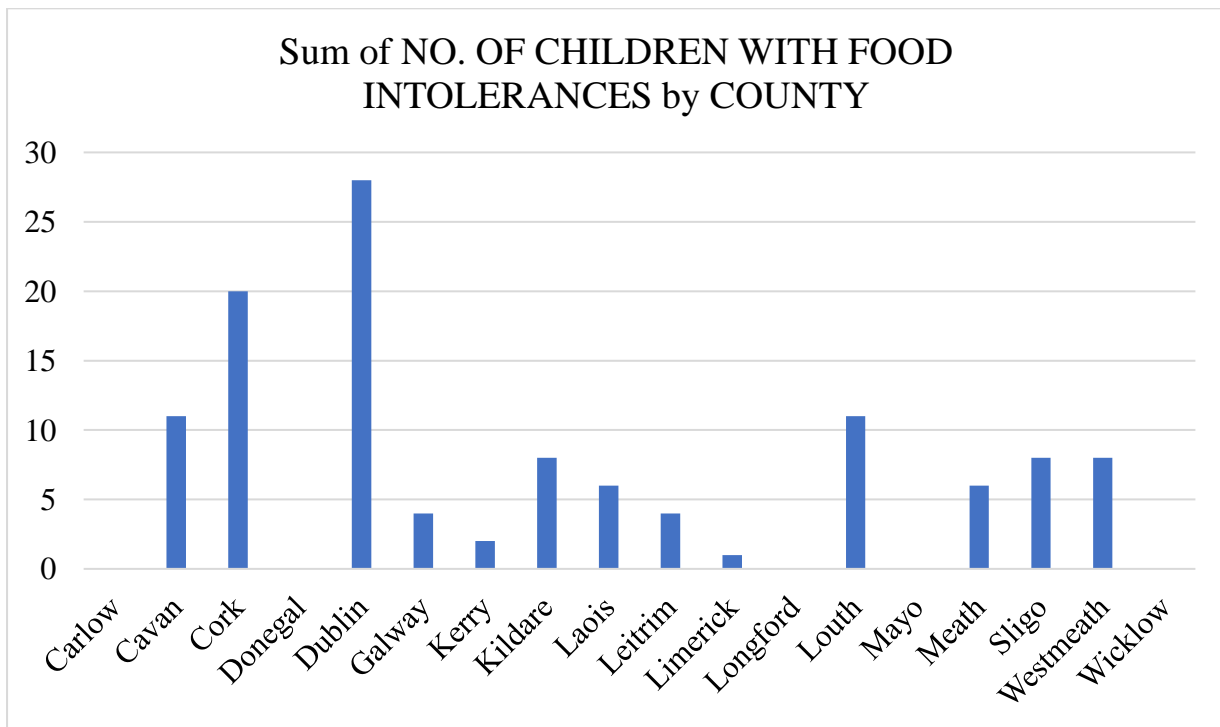
| County Of Northern Ireland | Sum Of Male |
|----------------------------|-------------|
| Antrim | 44 |
| Armagh | 12 |
| Down | 232 |
| Fermanagh | 4 |
| Londonderry | 28 |
| Tyrone | 122 |

Chart 4.7. Total Children In Island Of Ireland



| Total Children | Female | Male |
|----------------|--------|------|
| 11681 | 4673 | 5137 |

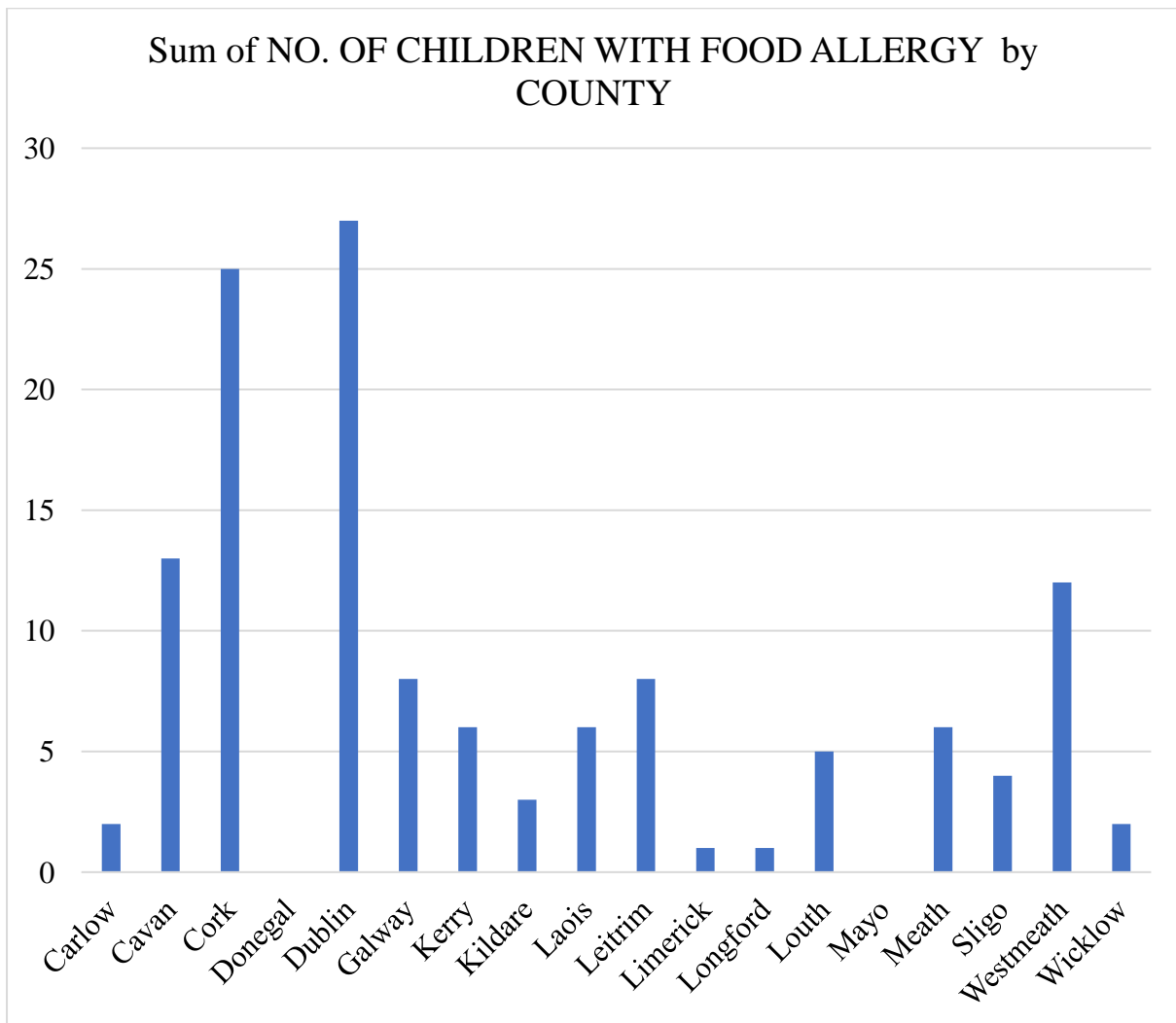
Chart 4.8. No. of children with food Intolerances in ROI



| COUNTY | Sum of NO. OF CHILDREN WITH FOOD INTOLERANCES |
|---------|---|
| Carlow | 0 |
| Cavan | 11 |
| Cork | 20 |
| Donegal | 0 |
| Dublin | 28 |
| Galway | 4 |
| Kerry | 2 |
| Kildare | 8 |
| Laois | 6 |

| | |
|-----------|----|
| Leitrim | 4 |
| Limerick | 1 |
| Longford | 0 |
| Louth | 11 |
| Mayo | 0 |
| Meath | 6 |
| Sligo | 8 |
| Westmeath | 8 |
| Wicklow | 0 |

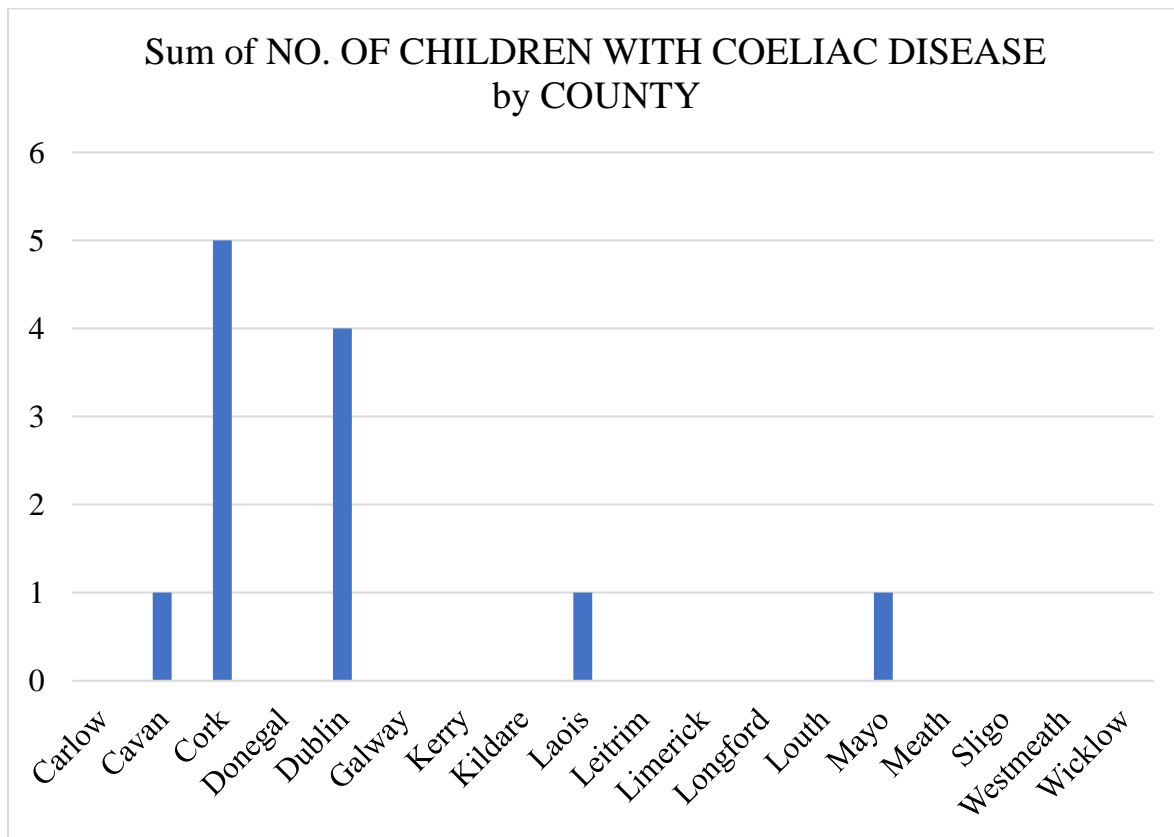
Chart 4.9. No. of Children with food allergy in ROI



| COUNTY | Sum of NO. OF CHILDREN WITH FOOD ALLERGY |
|---------|--|
| Carlow | 2 |
| Cavan | 13 |
| Cork | 25 |
| Donegal | 0 |
| Dublin | 27 |
| Galway | 8 |

| | |
|-----------|----|
| Kerry | 6 |
| Kildare | 3 |
| Laois | 6 |
| Leitrim | 8 |
| Limerick | 1 |
| Longford | 1 |
| Louth | 5 |
| Mayo | 0 |
| Meath | 6 |
| Sligo | 4 |
| Westmeath | 12 |
| Wicklow | 2 |

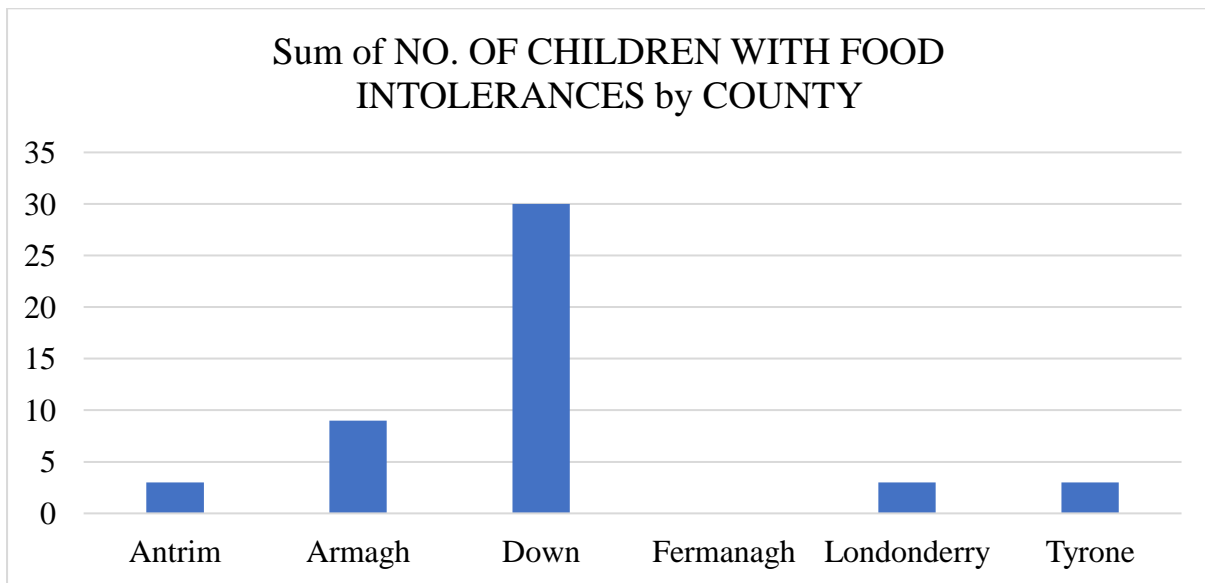
Chart 4.10. No. of children with Coeliac disease in ROI



| COUNTY | Sum of NO. OF CHILDREN WITH COELIAC DISEASE |
|---------|---|
| Carlow | 0 |
| Cavan | 1 |
| Cork | 5 |
| Donegal | 0 |
| Dublin | 4 |
| Galway | 0 |
| Kerry | 0 |
| Kildare | 0 |
| Laois | 1 |

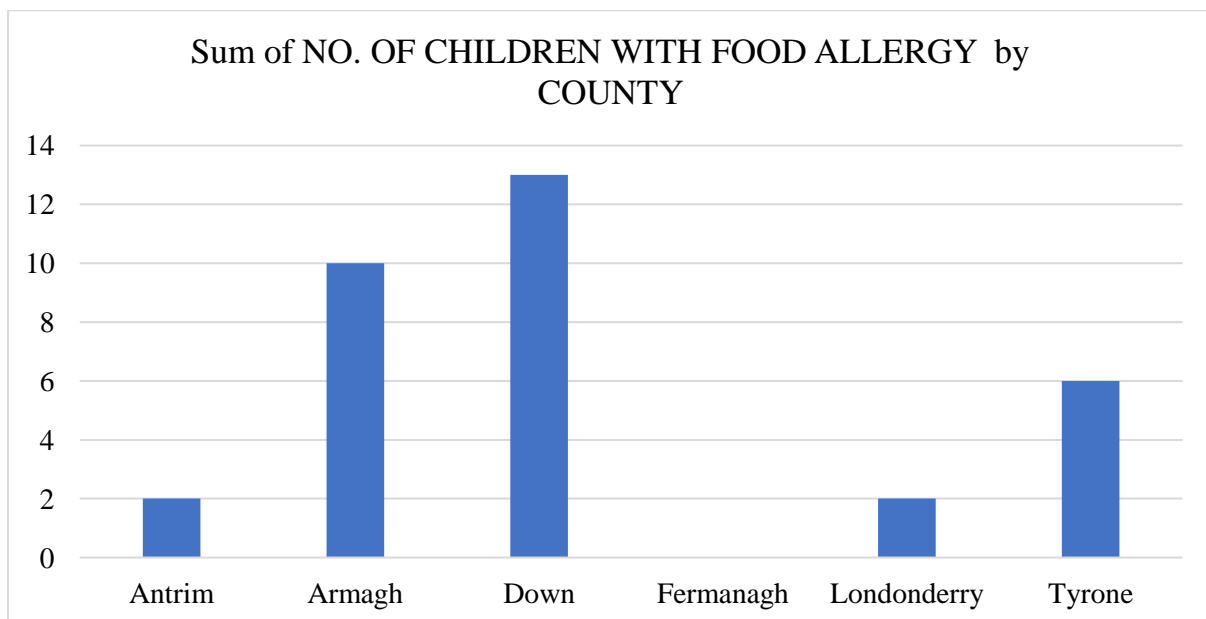
| | |
|-----------|---|
| Leitrim | 0 |
| Limerick | 0 |
| Longford | 0 |
| Louth | 0 |
| Mayo | 1 |
| Meath | 0 |
| Sligo | 0 |
| Westmeath | 0 |
| Wicklow | 0 |

Chart 4.11. Total No. of children with food intolerances in NI



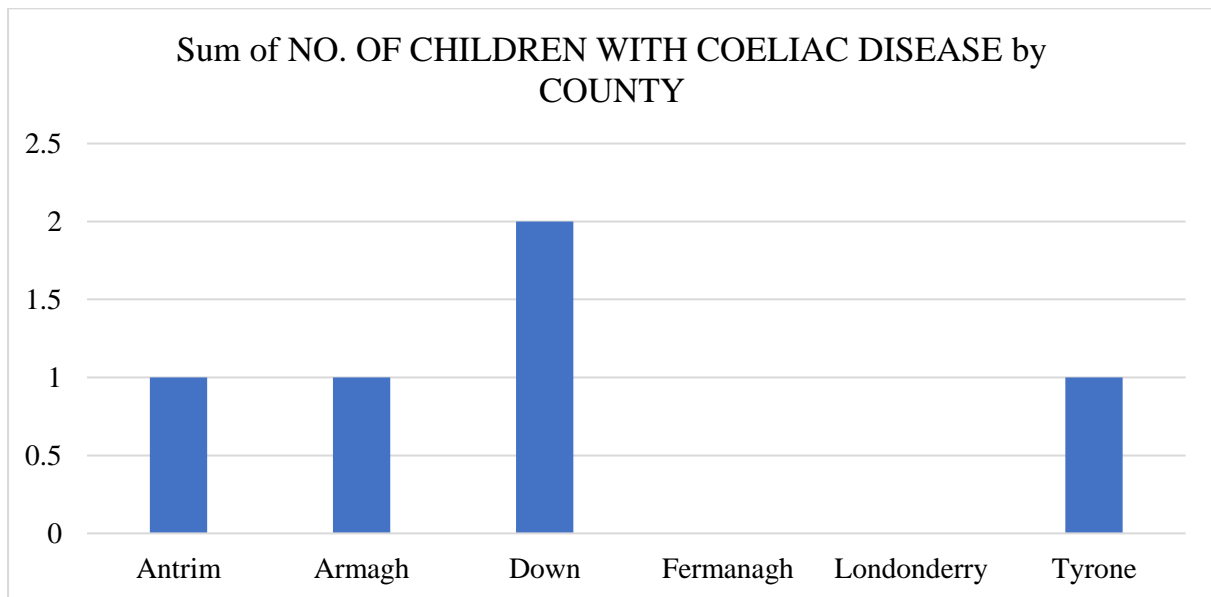
| County | Total No. Of Children with Food Intolerances |
|-------------|--|
| Antrim | 3 |
| Armagh | 9 |
| Down | 30 |
| Fermanagh | 0 |
| Londonderry | 3 |
| Tyrone | 3 |

Chart 4.12. Total No. of children with food allergy in NI



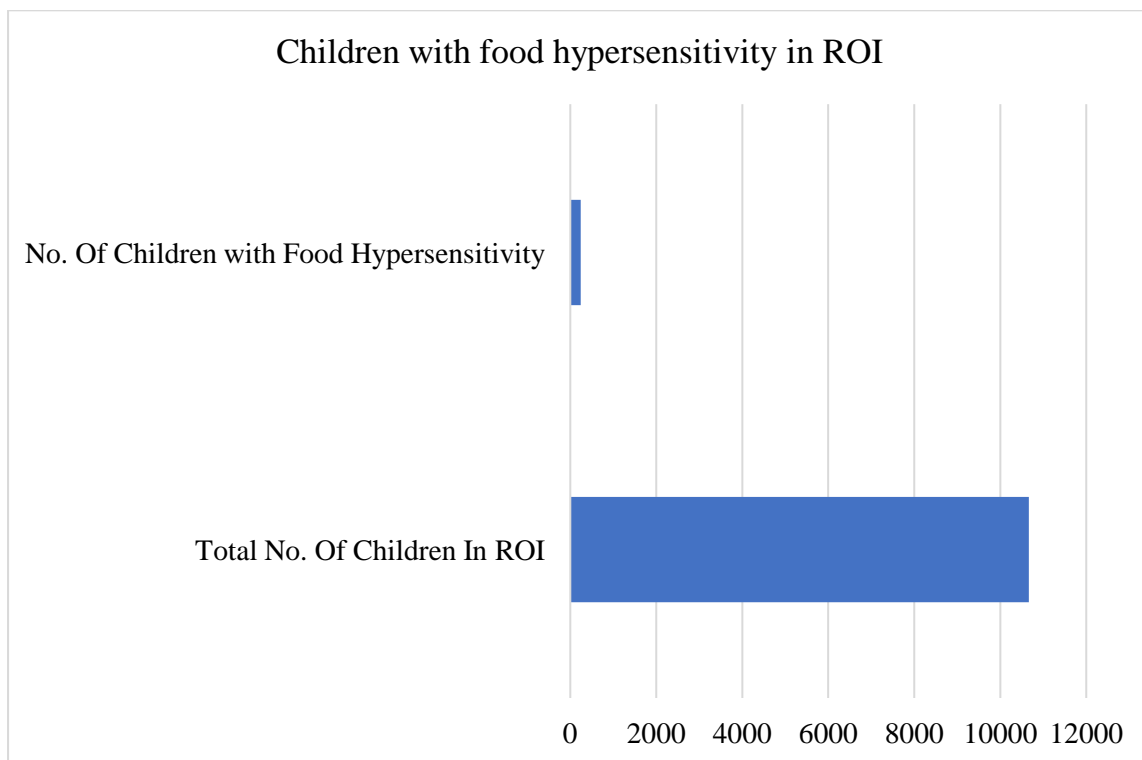
| County | Total No. Of Children with Food Allergy |
|-------------|---|
| Antrim | 2 |
| Armagh | 10 |
| Down | 13 |
| Fermanagh | 0 |
| Londonderry | 2 |
| Tyrone | 6 |

Chart 4.13. Total No. of children with Coeliac disease in NI



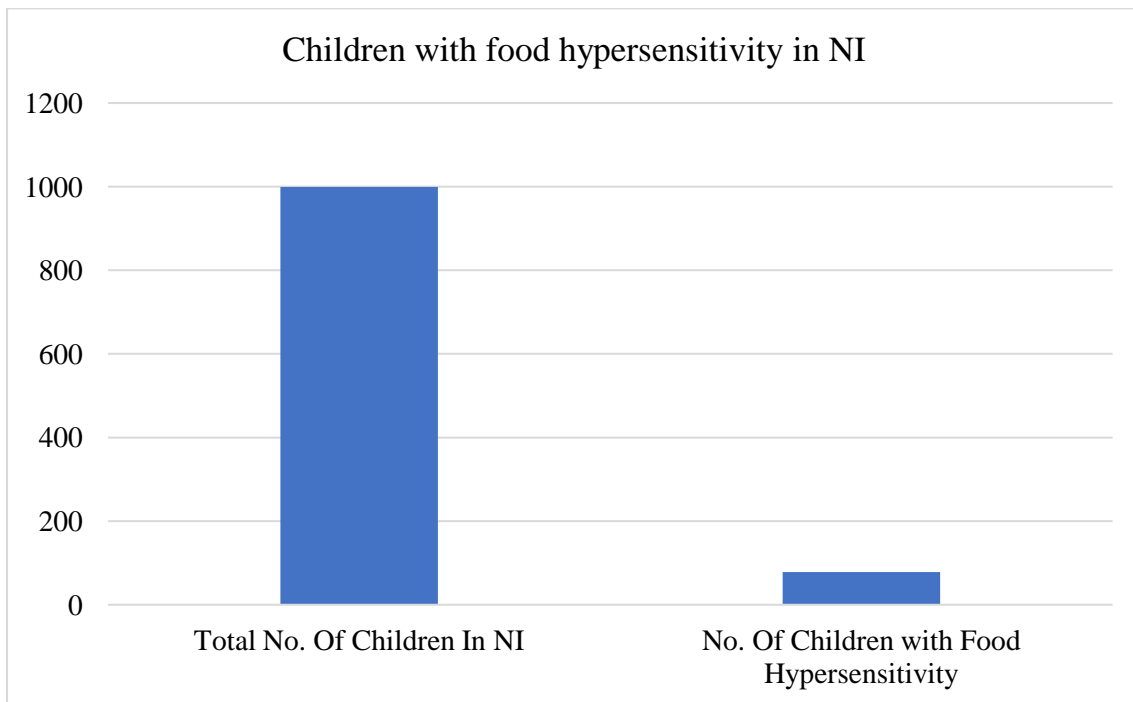
| County | Total No. Of Children with Coeliac Disease |
|-------------|--|
| Antrim | 1 |
| Armagh | 1 |
| Down | 2 |
| Fermanagh | 0 |
| Londonderry | 0 |
| Tyrone | 1 |

Chart 4.14. Total No. of children (0-12 years) with food hypersensitivity in ROI



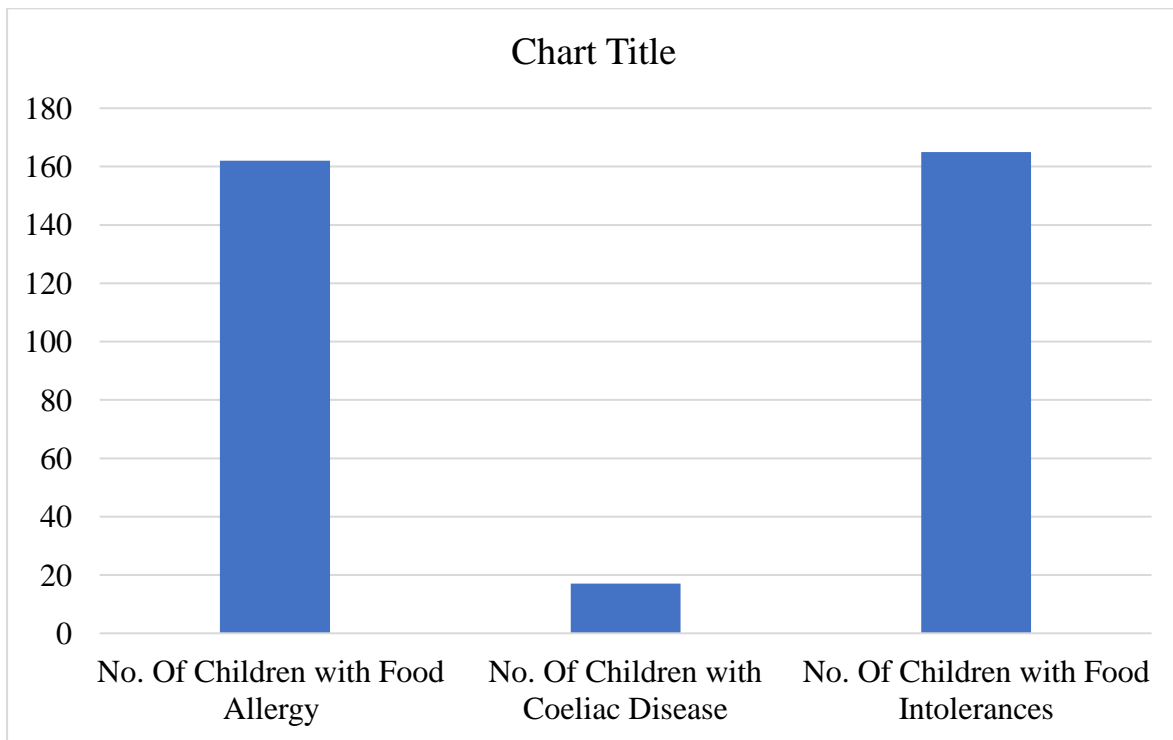
| | |
|------------------------------|--|
| Total No. Of Children In ROI | No. Of Children with Food Hypersensitivity |
| 10663 | 240 |

Chart 4.15. Total No. of children (0-12 years) with food hypersensitivity in NI



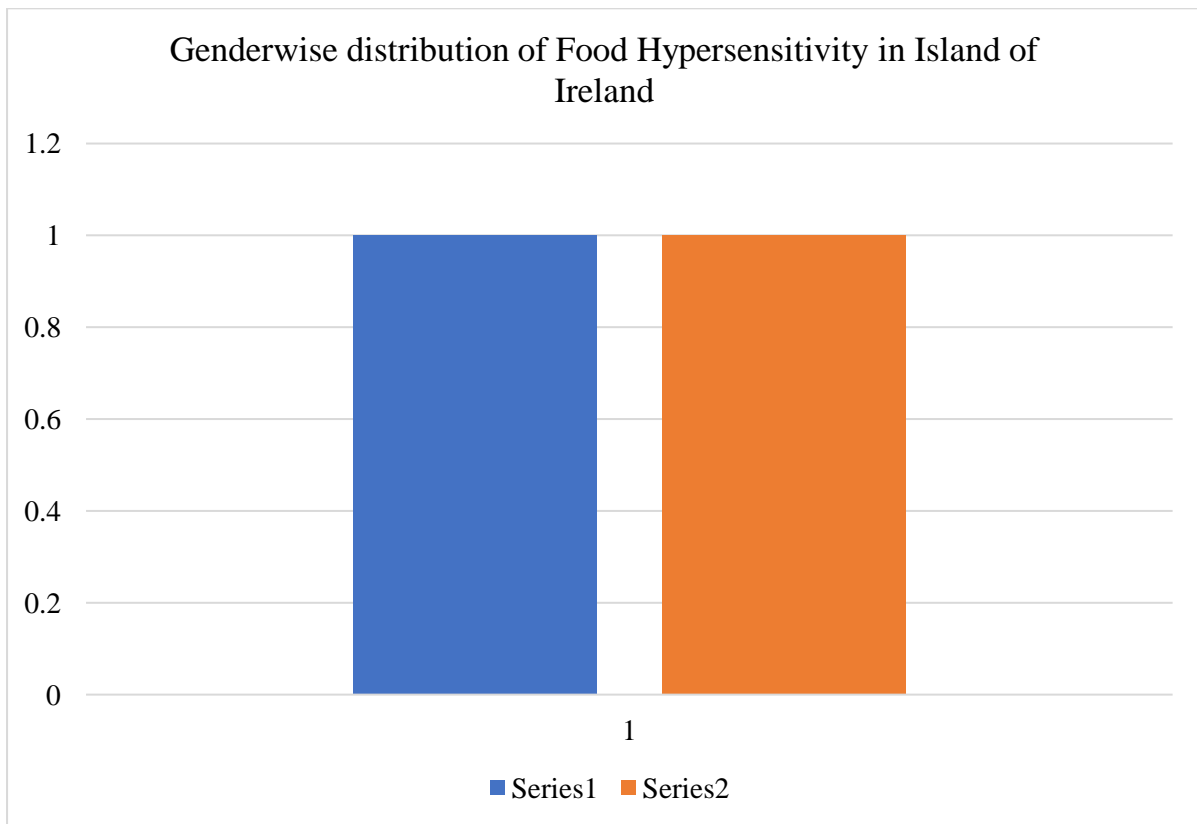
| | |
|--------------------------------------|--|
| Total No. Of Children In NI | No. Of Children with Food Hypersensitivity |
| 999 | 78 |

Chart 4.16. Total No. of children (0-12 years) with food hypersensitivity in Island of Ireland



| No. Of Children with Food Allergy | No. Of Children with Coeliac Disease | No. Of Children with Food Intolerances |
|-----------------------------------|--------------------------------------|--|
| 162 | 17 | 165 |

Chart 4.17. Gender wise distribution of Food Hypersensitivity in Island of Ireland



| GENDER OF CHILDREN WITH FOOD HYPERSENSITIVITY | NO. OF CHILDREN WITH FOOD ALLERGY | NO. OF CHILDREN WITH FOOD INTOLERANCES |
|---|-----------------------------------|--|
| F | 56 | 67 |
| M | 74 | 88 |

2.6. Comments and Recommendations from Childcare Facilities

- ✓ All the comments stated here are from the childcare facility manager or a staff and are kept in state the fact that Training is crucial, and people are ready to attend them as far as government provide proper training and provide EpiPens.
- ✓ Also, it was asked in comments that more information and provision of menu or diet chart would be helpful to the childminders.
- ✓ More knowledge in the area of Food Intolerances must requirement.
- ✓ There are few childminding services which were not aware of Food Intolerances, use of EpiPen, requirement and essentiality of trained person in case of FA emergencies etc.
- ✓ Distribution of Leaflets to parents, guardians and childminders along with EYS staff regarding intolerances, how to tackle them, alternatives for allergen triggering foods, and in chronic or fatal disease or events doctor recommended meal plans can help in improving knowledge regarding food intolerances.
- ✓ It was significantly emphasized that allergen management altogether is very expensive process that too without any help from government and parents is financial burden to the childcare facilities especially to the non-charitable organizations such as community childcare. In most of the cases manager or staff must bare expenses for the allergen management, training etc. which is not helpful considering their wages and is not economical as well.
- ✓ Much emphasize was kept on providing government training for allergen management and usage of EpiPen.

- ✓ Along with Education, facility and services inspection, TUSLA (in republic of Ireland) and education department altogether in Island of Ireland should inspect allergen management policy and actual allergen management facilities within the organization in order to tackle such sensitive issues as children are our future and jeopardizing their health at such an early stage of their life will not help them in their future endeavors.

Section 4: DISCUSSION

As mentioned in the results section, Total of 980 surveys were sent to the various childcare facilities within the Island of Ireland. Among them 800 were sent in childcare facilities situated within Republic of Ireland only in its 28 counties and 180 surveys in Northern Ireland (6 different counties). All the childcare facilities are registered with the Education department within government. Among these 192 facilities replied in the ROI which is 24% response rate and 19 from NI (10.55% response rate). Altogether from 211 responses were generated out of 980 surveys sent electronically which is about 22% response rate and is large enough population size to statistically analyze and conclude any result. Among all the responses gathered, ROI has 93 complete responses and 99 incomplete responses. The responses were considered incomplete just because a person did not elaborate on some of the questions asked or has not left comment or has decided not to go through full survey after filling in numbers and several values. NI has very low survey response rate but then from 19 responses received, only 1 response was incomplete all the 18 were completed survey responses. Which will generate accurate data and are much more reliable.

On an average people spend 12.055 minutes on the survey completion. People in ROI has spent 9.22 minutes on average to respond and people from NI have spent 14.89 minutes on an average to finish the survey.

Among all the counties, Dublin has highest number of children in childcare facility completing survey i.e. 1069, then cork 675, Galway 457 and Kilkenny being the last only with 12 children in the childcare facility in age span of 0 to 12 years. From NI Down being highest in terms of responses (7 responses – 36.84%), Tyrone being second highest (6 responses- 31.58%), Antrim and Armagh 2 responses each (10.53%) and Londonderry and Fermanagh only have 1 response each i.e. 5.26% of all.

From the obtained survey results it is evident that Dublin has highest number of childcare facilities in ROI (25.81%), Wexford, Waterford and Tiperrary being 0% as no childcare facility from these areas has responded. And 6 childcare facilities, 3.23% opted not to mention their location. Among all the responses received from NI there are 15 sessional pre-school services, 1 from part time day service, 4 are from fulltime day care.

Full day-care services being almost half of the childcare facilities (47.49%) – 85 among 274 and Sessional pre-school services being the highest – 124 in total contributing 69.27% of all. Whereas temporary pre-school service and overnight pre-school service being 0 in the statistics count. There are only 1.12 % childminding facilities either responded or has been registered with TUSLA in ROI. And for NI EYS registered with Department of Education were contacted. It can be said from the data that in 178 childcare facilities there are total of 10663 children are being minded. On an average about 60 children in each facility where 6 being minimum number of children enrolled in the childcare service and 260 being the maximum number of children in any childcare facility in ROI. Male children contributing 44.03% with 4695 numbers altogether and female children 39.83% 4248 in the ROI. 1720 children have not disclosed their gender. For NI, data depicts 1018 children in 19 facilities with 442 male children and 425 female children within the age of 0 to 12 years.

In ROI 284 (2.66%) children have food allergy, 26 (0.24%) have Coeliac disease and 250 (2.34%) children have food intolerances. And in NI 33 (3.24%) children are there with food allergy, 5 (0.49%) with Coeliac disease and 48 (4.7%) are suffering from food intolerances.

As per Gender wise distribution data, it can be said that Food Hypersensitivity is more prevailed in male children than female. Statistically it is evident that about 43.07% female have Food Allergy and 43.22% have any sort of food intolerance whereas more than half of the male children i.e. 56.92% and 56.77% have Food Allergy and Food Intolerances respectively.

Almost 73% childcare facilities have written food allergy (70 out of 329), 70% (68) has peanut ban policy, 56% with emergency plan in place to manage anaphylaxis, 55% have allergen management plan for allergic individuals, 42% with no food sharing policy, 32% have specific allergen food banned on site and almost 7% of childcare facility in ROI does not have any policy or management to tackle food allergy or food hypersensitivity.

Almost 73% childcare facilities allow children to bring their own food, 43% prepares food on-site and about 10 % brought meals from out-side which is served to children under their care. Some of them provides light snacks, rice cakes, gluten free cakes, toast, water, milk breakfast cereals, fruits, crackers o the child. In NI allergen management is better than ROI: 13 facilities have peanut/nut ban policy on-site and 72.22% have emergency plan to manage anaphylaxis shock. 9 facilities have allergen management policy in written and 6 of each have no food sharing policy plus ban of specific allergens in the facility. Only 1 facility does not seem to have allergen management plan in place. 10 facilities in NI prepares food on-site, 4 provides meals prepared from off-site, 1 facility let children bring their own food.

Events where a childcare facility must use allergen management (6.25%) or to use EpiPen (3.12 %) accounts 3 to 6 cases in past 12 months. On the other hand, no incident of food hypersensitivity reaction accounts almost 86% in ROI. For NI only one incident was noted when they have to use an EpiPen in past 12 months and 1 incident not in past 12 months.

In terms of allergen management and training as part of the food safety, childcare facilities in ROI has significant persons: 47% of the facilities have person trained to tackle food hypersensitivity reaction who look after food preparation on-site or food handling r meal on-site. Within NI 15 facilities have person trained on food allergen management who prepares food on-site and all those 15 facilities have allergen management plan as part of the food safety management.

At least 44% of the childcare facility has a trained person to use EpiPen. About 20% of them have trained individual but wishes to have another trained member. 14 % does not have any staff member trained to use EpiPen and about 32% wish to have trained individual but haven't got any person who is trained to use EpiPen. 17 facilities in NI has trained person who can use EpiPen when is needed and 1 facility only wished to have another person to be trained for using EpiPen.

From the obtained datasets, after analyzing all the data it is evident that children with food hypersensitivity are more vulnerable towards foods like hen's egg, cow's milk and peanut. Also, Lactose intolerances and Gluten Intolerances accounts significant number in food hypersensitivity.

Although, Northern Ireland seems to have better allergen management, children with Coeliac diseases accounts almost half of the percentages in food intolerances hence can be said that Coeliac disease is more prevailed among children in Northern Ireland than the Republic of Ireland.

Section 5: SUMMARY AND RECOMMENDATIONS

To conclude, it is significant from this study that male children population in between age of 0 to 12 years are more vulnerable to the food intolerances with compare to female children in Ireland. Hence, more strict regulations are required in this area to avoid incidences and spread knowledge among parents and childcare practitioners.

It is evident that hen's egg, cow's milk, peanut and in some cases meats like pork, lamb, widely used medicine for cold and flu Calpol is even the triggered food for food hypersensitivity.

From the data obtained, it is depicted that more than 70% of childcare facilities follows allergen management and implements various allergen policies within the premises also they needed government support to manage the issue as in terms of economical support because allergen management is costly comparatively with respect to food provision, manpower, trained staff etc.

Northern Ireland seems to have more efficient system in terms of allergen management with respect to Republic of Ireland even though it has less population.

It is recommended that government should provide more training in terms of EpiPen usage, allergen management leaflets distribution, and seminars in order to prevent unfortunate scenarios. And furthermore, research and data collection should be compiled for vast population ranges.

Section 6: REFERENCES

1. W. Jean Dodds (2019), *Diagnosis of Feline Food Sensitivity and Intolerance Using Saliva: 1000 Cases*, MDPI, Basel, Switzerland
2. Venter C., et al. (2015), *Health-Related Quality of Life in children with perceived and diagnosed food hypersensitivity*, *Pediatric Allergy Immunol* 2015: 26: 126–132.
3. Venter C, et al. (2016), *Prevalence and cumulative incidence of food hyper-sensitivity in the first 10 years of life.*, *Paediatric Allergy Immunol* 2016: 27: 452–458.
4. Stephen H (1995), *Clinical and Experimental Allergy, British Society of Allergy and Clinical Immunology 1995*, Volume 25, Supplement 1, page 1
5. S. Carr S., et al (2012), *CSACI Position statement on the testing of food-specific IgG, Allergy, Asthma & Clinical Immunology 2012*, 8:12, doi:10.1186/1710-1492-8-12
6. Rene Red, "pin - prick " IgG ELISA delayed Food Allergy Essay. Available on: <http://www.vorkallergyUSA.com>
7. Primeau, M. et al. (2000) 'The psychological burden of peanut allergy as perceived by adults with peanut allergy and the parents of peanut-allergic children', *Clin Exp Allergy*, 30, 1135-43.
8. Philip Thomton, *EpiPen*, *Drugs.com, Know more, Be sure*, Jun 4, 2019. Available at: <https://www.drugs.com/epipen-auto-injector.html#moreResources>
9. Ming Z., et al (2016), *Investigation of 14 Food Allergen-Specific IgG Antibodies in 1299 Children*, *International Journal of Food Properties*, 19:25–30, 2016, DOI: 10.1080/10942912.2014.96878
10. Liz Beavis, *Dietary Management of Food Intolerances*, Newtown Nutrition, Warringal Publications

11. Jean M., Puri B. (2014), *The effect of pulsed electromagnetic field therapy on food sensitivity*, *Electromagn Biol Med*, 2015; 34(4): 298–301, DOI: 10.3109/15368378.2014.906450
12. Janice M., Tom S. (2000), *Stress Profile of Clients Referred for Investigation of Food Allergy*, *Journal of Nutritional & Environmental Medicine* 10, pp 289–296
13. J. Isabel, Skypala (April 3, 2019), *Food-Induced Anaphylaxis: Role of Hidden Allergens and Cofactors*, *Frontiers of immunology*, doi: 10.3389/fimmu.2019.00673
14. Helen C., et al. (2018), *Quality of life in coeliac disease: qualitative interviews to develop candidate items for the Coeliac Disease Assessment Questionnaire*, *Patient Related Outcome Measures*, 2018:9 211–220
15. Grey. O., et al, *How to give EpiPen*, Jr 1, p.10
16. Grabenhenrich, L. B. *et al.* (2016) ‘*Anaphylaxis in children and adolescents: The European Anaphylaxis Registry*’, *Journal of Allergy and Clinical Immunology*, 137(4), pp. 1128-1137.e1. doi: 10.1016/j.jaci.2015.11.015.
17. FSA, (2002) *May contain labelling - the consumers perspective. UK: Food Standards Agency.*
18. Francesca P, et al. (2015), *Adverse Food Reaction and Functional Gastrointestinal Disorders: Role of the Dietetic Approach*, *Department of Medical and Surgical Sciences*, University of Bologna, Bologna, Italy. Available at: <http://www.jgld.ro/wp/archive/y2015/n3/a9>
19. Fischer, D. *et al.* (2018) ‘*Anaphylaxis*’, *Allergy, Asthma and Clinical Immunology*, 14(Suppl 2). doi: 10.1186/s13223-018-0283-4.
20. DOI: <http://dx.doi.org/10.15403/jgld.2014.1121.243.paq>
21. Allergic...Or Just Sensitive?, *Nutrition Action Healthletter*, May 2019.

22. A. Ferguson (1995), *Scope and diagnostic criteria of food sensitivity*, *Clinical and Experimental Allergy*, Volume 25, pages 111-113

Section 7: RESEARCH ARTICLE

AN INVESTIGATION INTO THE PREVALENCE OF FOOD HYPERSENSITIVITY AMONGST CHILDREN IN THE EARLY YEARS SERVICE IN IRELAND

Authors: Ruta Patel, Sara Boyd, Eliza Dimla, Dr. Ciara Walsh

(SafeFood and TU Dublin, Republic of Ireland, 2020)

Abstract: Purpose: To evaluate relevance for class, sex, and diet caused food hypersensitivity among the 0 to 12-year-old children in Ireland, along with policies on food safety in child care facilities.

Introduction: In the era where Globalization has made world a really small place for trading, all kind of food is available in each season and everywhere, there is significant number of people with food intolerances who suffers because of lack of knowledge and treatments available even with widespread research facilities and advanced technologies emerging in all kind of research areas, food hypersensitivity can be considered as a most underrated study area due to lack of research and technics available to manage it and avoiding the triggered food being the only solution for food hypersensitivity which implies that more knowledge in terms of research and literature in this area is required.

Most common mistake observed in day to day world is considering food allergy and food intolerances as a same term and approaching for the same treatment for both of them which is

usually avoiding one food in diet. But it is evident in most of the cases that there can be one or more than one food which triggers food hypersensitivity in an individual also the dosage for stimulating food hypersensitivity differs among each human being reliant on IgE existing in their body.

Methodology: This study encompasses results derived from dataset compiled 980 government registered childcare facilities in Ireland and total of 11681 children under age of 0 to 12 years old. In this quantitative and qualitative study, electronic survey comprehending questionnaire including questions regarding age, gender, food hypersensitivity be it food allergy, food intolerances or coeliac disease, food safety management, allergen management policies, and management of allergen or anaphylaxis incidences in the year 2019.

An electronic survey attached with declaration letter – cover letter comprehending privacy statements, dataset generation, data management was distributed on Limescale survey platform. It has 13 questions in total which addresses mainly demographic data, gender, age, triggered food, food hypersensitivity and management of intolerances within the premises.

Obtained Dataset was analysed to generate outcomes enlisted below in result section with Excel

Ethics Permission: Ethical permission for this survey was obtained from TU Dublin ethics committee.

Result: Total response rate of 22% from 980 total surveys distributed in 34 counties (28 in the Republic of Ireland and 6 in Northern Ireland) almost half of them being full day care services (47.49%) minds total of 11681 children under title of EYS – Early Years Services , mostly 0 to 12 years old age groups in them has nearly 2 to 3% population which suffers from one or another sort of food intolerances.

Recommendations:

Declaration of Interests: The authors declare no conflicts of interest. The author solely is responsible for the content of this article and results.

Bibliography:

1. W. Jean Dodds (2019), *Diagnosis of Feline Food Sensitivity and Intolerance Using Saliva: 1000 Cases*, MDPI, Basel, Switzerland
2. Venter C., et al. (2015), *Health-Related Quality of Life in children with perceived and diagnosed food hypersensitivity*, *Pediatric Allergy Immunol* 2015; 26: 126–132.
3. Venter C, et al. (2016), *Prevalence and cumulative incidence of food hyper-sensitivity in the first 10 years of life.*, *Paediatric Allergy Immunol* 2016; 27: 452–458.
4. Stephen H (1995), *Clinical and Experimental Allergy*, *British Society of Allergy and Clinical Immunology* 1995, Volume 25, Supplement 1, page 1
5. S. Carr S., et al (2012), *CSACI Position statement on the testing of food-specific IgG*, *Allergy, Asthma & Clinical Immunology* 2012, 8:12, doi:10.1186/1710-1492-8-12
6. Rene Red, "pin - prick " IgG ELISA delayed Food Allergy Essay. Available on: <http://www.vorkallergyUSA.com>
7. Primeau, M. et al. (2000) 'The psychological burden of peanut allergy as perceived by adults with peanut allergy and the parents of peanut-allergic children', *Clin Exp Allergy*, 30, 1135-43.
8. Philip Thornton, *EpiPen*, *Drugs.com*, *Know more, Be sure*, Jun 4, 2019. Available at: <https://www.drugs.com/epipen-auto-injector.html#moreResources>

9. Ming Z., et al (2016), *Investigation of 14 Food Allergen-Specific IgG Antibodies in 1299 Children*, *International Journal of Food Properties*, 19:25–30, 2016, DOI: 10.1080/10942912.2014.96878
10. Liz Beavis, *Dietary Management of Food Intolerances*, Newtown Nutrition, Warringal Publications
11. Jean M., Puri B. (2014), *The effect of pulsed electromagnetic field therapy on food sensitivity*, *Electromagn Biol Med*, 2015; 34(4): 298–301, DOI: 10.3109/15368378.2014.906450
12. Janice M., Tom S. (2000), *Stress Profile of Clients Referred for Investigation of Food Allergy*, *Journal of Nutritional & Environmental Medicine* 10, pp 289–296
13. J. Isabel, Skypala (April 3, 2019), *Food-Induced Anaphylaxis: Role of Hidden Allergens and Cofactors*, *Frontiers of immunology*, doi: 10.3389/fimmu.2019.00673
14. Helen C., et al. (2018), *Quality of life in coeliac disease: qualitative interviews to develop candidate items for the Coeliac Disease Assessment Questionnaire*, *Patient Related Outcome Measures*, 2018:9 211–220
15. Grey. O., et al, *How to give EpiPen*, Jr 1, p.10
16. Grabenhenrich, L. B. et al. (2016) ‘*Anaphylaxis in children and adolescents: The European Anaphylaxis Registry*’, *Journal of Allergy and Clinical Immunology*, 137(4), pp. 1128-1137.e1. doi: 10.1016/j.jaci.2015.11.015.
17. FSA, (2002) *May contain labelling - the consumers perspective*. UK: Food Standards Agency.
18. Francesca P, et al. (2015), *Adverse Food Reaction and Functional Gastrointestinal Disorders: Role of the Dietetic Approach*, Department

- of Medical and Surgical Sciences*,
University of Bologna, Bologna,
Italy. Available at:
<http://www.jgld.ro/wp/archive/y2015/n3/a9>
19. Fischer, D. *et al.* (2018)
'Anaphylaxis', *Allergy, Asthma and
Clinical Immunology*, 14(Suppl 2).
doi: 10.1186/s13223-018-0283-4.
20. DOI:
<http://dx.doi.org/10.15403/jgld.2014.1121.243.paq>
21. Allergic...Or Just Sensitive?,
Nutrition Action Healthletter, May
2019.
22. A. Ferguson (1995), *Scope and
diagnostic criteria of food
sensitivity*, *Clinical and
Experimental Allergy*, Volume 25,
pages 111-113