COMPARISON OF ALLERGEN LEGISLATION
BETWEEN INDIA AND IRELAND

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Abstract

Food allergen is one of the major issues in countries like Ireland and India. In Ireland, allergen and ingredients labelling are considered as the topmost problems in the Irish food business. The problems can be solved under a strict framework guided by strong regulations. The problem is bigger in India than Ireland as in India, there is no proper legalized standard in the context of food allergens so the people who are allergic to certain food products are on high risk. Labelling is a major issue in India due to pluralism and diverse linguistic barriers. Ireland operated FSAI is performing well under the supervision of the Irish government while India controlled FSSAI is not able to show its performance in maintaining its effectiveness in detecting food allergens.

Absence and improper implementation of the standard have become an issue in both India as well as Ireland. The study focuses on comparative analysis between the food allergen standard of Ireland and India. Through this method, the opportunities and challenges faced in the detection of food allergen in the stuff which they consume. The study has provided a brief introduction about the food allergen and food allergen standard of India and Ireland. It has also focused on the different food item that may cause allergy to the people.
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 guidelines for dissertation production in the MSc Food Safety Management and has not been submitted in whole or as part of an award in any other University or Institute.

The work reported on in this conforms to the principles and requirements of the University guidelines for ethics in research.

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Date…………………………………………
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ABBREVIATIONS LIST

US – United States
WAOJ – World Allergy Organization Journal
VITAL – Voulantry Incidental Trace Allergy Journal
PAL – Precautionary Allergy Labelling
EU – European Union
FIC – Food Information for Consumers
FAO – Food and Agriculture Organisation
UN – United Nations
FSAI- Food Safety Authority of Ireland
FSSAI – Food Safety and Standard Authority of Ireland
CA – Codex Alimentarius
FSS – Food Safety and Standards Regulations
EC – European Council
FSANZ - Food Standards Australia New Zealand
AU – Australia
NZ - New Zealand
AFSA – Alliance for Food Sovereignty in Africa
SAFFA – South African Food Sensitisation and Food Allergy
SA – South Africa
CFIA - Canadian Food Inspection Agency
HC – Health Canada
USA – United States Of America
FDA – Food and Drug Administration
UAE – United Arab Emirates
AED – United Arab Emirates Dirham
TFDA – Taiwan Food and Drug Administration
CAA - Certification and Accreditation Administration
SFA – Singapore Food Agency
HACCP – Hazard Analysis and Critical Control Point
GMP – Good Manufacture Practice
LFD - Lateral Flow Device
ELISA – Enzyme-Linked Immune Sorbent Assay
PCR - Polymerase Chain Reactions
DNA – Deoxyribose Nucleic Acid
RNA – Ribo Nucleic Acid
RTPCR - Real-Time Polymerase Chain Reactions
NDA – Panel on Nutrition, Novel Foods and Food Allergens
LOD – Limit of Detection
ROI – Republic of Ireland
RASFF – Rapid Alert System for Food and Feed
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CHAPTER 1:- LITERATURE REVIEW
1. **Introduction**

This study focused on the different standards which are associated with the food allergens. The study would also identify different food allergens standard of Ireland and India and compare them to know the best approach in the context of safety of food management. The study would also recommend various strategies which can be further utilized to improve the standards associated with the food allergens of India and Ireland.

Food allergen is considered a growing issue across the world, the standard related to the food allergens helps to minimize the risk of reactions that can happen due to the food allergen. Across the world, there are many causes were due to the food allergens many patients have to face life-threatening. For example, in the US only, food allergy causes an anaphylactic reaction which results in 200 deaths and 2000 hospitalization every year. They are the fifth biggest interminable disease in the US, and specialists are revealing an ascent in the number of individuals with food allergies over the world. (“Food Allergies on the Rise”)

A report released in 2013 by Centers for Disease Control and Prevention, a US government organization, says, "Among kids aged 0–17 years, the commonness of food allergies expanded from 3.4 per cent in 1997–1999 to 5.1 per cent in 2009–2011." (“Food Allergies on the Rise”)

The World Allergy Organization Journal (WAOJ) collected information from 89 nations, including the published data and changes in the health care burden of food allergy, study says that the greater part of the nations reviewed (52/89) didn't have any information on food allergy prevalence. Just 10 per cent (9/89) of nations had exact food allergy prevalence data, this study was published in December 2013 in the World Allergy Organization Journal (WAOJ). The specialists found that in the developed nations one in every ten babies has a food hypersensitivity. (“Food Allergies on the Rise”)

In the book “Living with Food Allergies” Author says, "With a populace of well over a billion, food allergy could turn into a huge issue in India. Up to 3 per cent of Indians may as of now have food sensitivities, most of these under 40 years old. The Author added that food allergies cause about 30,000 emergency treatment and 100 to 200 deaths for every year in the country and up to 3 million Indians have peanut allergic reaction approximately. (“Food Allergies on the Rise”)

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The predominance of food allergies around the globe is accepted to be expanding, with over 8% of children’s and 2% of grown-ups in countries like Australia and New Zealand having an allergic reaction to at least one food item. Practically all foods have the ability to cause an allergic reaction in an individual who has become sensitised to proteins in it. (“What Are Food Allergens? Key Food Allergens | Allergen Bureau”). Voluntary Incidental Trace Allergen Labelling (VITAL) is a hazard-based procedure for food manufacturers to use in assessing the effect of cross-contamination of allergen to demonstrate proper PAL (precautionary allergen labelling). The use of VITAL aims to stay away from indiscriminate utilization of precautionary labelling and in this way protect its value as a risk management tool and minimizing risk to allergic consumers. (“VITAL ® Voluntary Incidental Trace Allergen Labelling| Allergen Bureau”). Notwithstanding, in Australia and New Zealand there are 9 foods or nutrition classes that cause about 90% of every single unfavourably allergic reactions peanuts, tree nuts, soy, milk, egg, grains, fish, fish, and sesame. (“What Are Food Allergens? Key Food Allergens | Allergen Bureau”)

In recent time food labelling is considered as an important element in order to improve the safety of customers those who are allergic to certain foods. Labelling of the food items has been incorporated by different manufacturers, industries, business and individual seller in order to minimize the risk to the customer and maintains its image within the market (Bhattacharya et al. 2018). Regulation regarding the allergen labelling has been standardised across the world to improve food safety for allergic families. People of different age group may have a food allergy but the rate of food allergy is very high within the preschool students (Bhattacharya et al. 2018). In India, the industry of food processing is mainly export-oriented and the country is still lagging behind in formulating domestic standards regarding the food allergens. On the other hand, in Ireland labelling of ingredients and food allergens is considered as the major issue of the Irish food business. In accordance to the EU Food Information for Consumer (FIC) Regulation the contract caterers, prisons, psychiatric institutions, nursing homes, hospitals, schools, creches, B&Bs, hotels, takeaways and restaurants must be the information regarding the allergen in written format and should have an appropriate location in all the EU countries like Ireland (“Food Information - FIC | Food Legislation | Legislation | The Food Safety Authority of Ireland”). In the year 2015, the United States Food and Drug Administration has rejected many of the exported food items of India because they were the labelling done in the product failed to provide the information regarding the
food allergen in the product. The companies whose products have been rejected are Nestle India Ltd. and Hadrian Snacks Private Ltd. in Ireland business are putting efforts by informing about the allergen either in their food menu or by adding on the chalk along with the special menu. Farmers, delicatessens and supermarkets in Ireland also has to mention the name of the allergen in their salads, bakery, loose ready meals items. Many of the countries have implemented the labelling regulation and made it compulsory for those businesses who are related with the food industry but in India, till date, there are no such mandatory standards regarding the allergen labelling in the food product. India lacks in experience in diagnosing or handling the allergen and techniques related to the diagnosis is also costly.

2. Evaluation of the food allergens standard

Food allergens stand allows the customer and seller both to identify the allergenic ingredients in food which help them protect the health from allergen food. Food which is pre-packed need to contain a list of ingredients and must emphasise on the allergenic ingredients. This step would help the allergic patient to avoid the intake of such food items (Soon, 2018). The product which is prepared and sold on the same premises did not have to provide any allergen information with their food because it is expected that the customer would directly ask the seller about the allergens but now the direct seller also has to provide allergen list along with the food they prepare because sometimes customers forget to ask about the ingredients and consume the food and this may become harmful for the customer. Food allergen standard helps to manage food safety in the industry also (Ward, 2015). It evaluates that all the products that contain allergens were properly labelled. Different allergen program conducted by the government provides the knowledge regarding different factors such as employees practice, nature of allergens, the consequence of allergens which helps the industry to minimize the allergen risk.

The standards related to the food allergens helps the industry to formulate a team which manage the work related to the allergen (Food Drink Europe, 2019). The team works towards constructing a successful allergen control plan in accordance with the standards. While formulating a product design the industry needs to incorporate the stated standard in order to decrease the potential effect of the allergens within the customer (Gruenfeldova, Domijan and Walsh, 2019). The industry has to maintain a transparent and trustworthy relationship with the supplier to ensure processing aids and raw materials were safe while entering to the company or market. The supplier selected by the
industry must have audit reports and accepted allergen control programs. Food allergen standards state that the person who receives the food package is liable to check all the materials, ingredients and labelling of the product in order to minimize the cross-contamination. In accordance with the standard vehicle should be in proper condition and it should be thoroughly checked before and after loading and unloading (Mee, P., 2019). Maintaining the food allergen standards by the seller of pre-packaged food seller, direct seller, industry among others is very important because it will minimize risk on intaking the allergen food by the customer that may cause serious health issues.

2.1 Identification of the standard associated with food allergens in India

According to the Codex Alimentarius commission 1999, guidelines the member countries to put the name of the common name of food allergens on food labels of the product (FAO, 2019). In India specifically, it is not mandatory to follow such guidelines of labelling on allergens. Though most of the countries across the world follow the allergic food labelling according to the allergenic foods in their country (Soon, 2018). The allergens of food are rising all around the world therefore specific food labels should be listed to minimize such issues. Presently India maintains only the nutritional declaration labelling of foods where the packed food needs to mention each ingredient used in the food product. This system of labelling the product allows consumers to easily choose the products on which is suitable for their consumption (Ward, 2015).

As per the regulation of food safety and standards 2011(labelling and packaging) it has declared mandatory to label for allergic foods specifically for infant milk substitute as on clause 7 of regulation no 2.4.1 states (FSSAI, 2011). The national awareness of food labelling for allergic contamination in food products serves as the primary link between consumer and manufacturer. The labelling covers safety both for information consumer interest and food (Laxmi Narayan and Chaudhury, 2016). To mitigate food allergens effectively in India, the regulatory bodies have come up with FSSAI a comprehensive process of Food Safety and Standards (Labelling and Packaging) Regulation. In India, two regulation has been declared in 2018, namely FSS regulation (claims and advertising) and FSS regulations (Packaging). According to the food safety and standards regulation (labelling and display) project, the food organizations are required to inform about the nutritional information like saturated fat, added sugar, calories, sodium and trans-fat on each front side of the product (Grace, 2015).
2.2 Identification of the standard associated with food allergens in Ireland

The Food Safety Authority of Ireland FSAI declared the food regulatory perspective and food ingredients and allergens labelling as the number one concern for Irish food organization. From recent reports of Ireland, it has been surveyed that the ingredients labelling and allergens come out as the top-rated concern in food safety department of the Irish food business. With a rating of 53%, the Irish food organization listed it on their top three concerns (Quann, 2019). For about 36% in food handling and food hygiene concern and about 30% of carcinogenic chemicals in food ranked highest among those surveys. The food information for consumer regulation of Irish food business states that the hotels, B&Bs, schools, hospitals, takeaways, nursing homes, prison and psychiatric institution should have allergen information in a composed format at the appropriate and conspicuous location. The Regulation (EC) No 1169/2011 on food information to consumers brings major changes in a way that the allergen information should appear on the packed foods after 13th December 2014. The implementation of (EC) No 1169/2011 also brought major changes on the labelling prepacked products of nutrition. Many organizations are aware of the nutrition label; therefore, some small changes will not be costly, difficult or time consuming for them (Gruenfeldova, Domijan and Walsh, 2019).

2.3 Comparison between the food allergen standard of India and Ireland

In India, there are no mandatory labelling of food allergens, but according to the research conducted many countries have a mandatory list of allergic foods. A detailed comparison is made between India and Ireland, concerning the food allergen standards of both the countries. This method of labelling in packaged foods helps the consumer to avoid food products that might cause an allergic reaction in their body. On the other hand, the food business in Ireland is concerned with making their products safe for consumers by focusing on the hygiene of packaged and raw foods (Mee, P., 2019). Moreover, the food regulatory authority of India is concerned with the hygiene of the food products, which causes health issues among the common people of the country. In addition to this, the national awareness of labelling allergic substance operates as the primary link between the buyers and sellers, which helps both parties to understand the ingredients used in a particular food. In India to eradicate the effects of food allergen, a governing body FSSAI has been developed, which regulates the safety and food standards within the country. On the other
hand, Ireland has some strict guidelines relating to food allergens in the country (Azad and Ahmed, 2016).
Ireland has a dedicated food and safety regulatory body of **FSAI** which presides over the quality and standard of food. In addition to this, the food safety and standards authority of India has made it mandatory to display the nutritional value of the packaged food, so that the consumer can avoid the food products which that causes are prone to cause allergic reactions to the health of the consumer. On the other hand, to resolve the allergic issues the Irish government has banned certain food products from the country. In Ireland hospitals, business, schools, business nursing home shall have information about allergens in a compact format, however, in India, there are no such mandatory regulations. The food and safety regulations authority of India is concerned with packaged products only, which shows the ingredients and nutritional values (FSSAI, 2018).
On the other hand, Ireland has regulations which show the nutritional values of all the food products. In Ireland, even small and medium business firms have the knowledge of the nutritional value of food this has helped prevent the sale of banned food products in the country. On the other hand, the knowledge of allergens is not widespread among the citizens hence the food allergies are prevalent in India. The food regulatory body in India has identified mainly lactogen products which have allergen products as they cause health issues to the consumers (McLeod, 2019).
The Indian food safety guidelines, as implemented by the FSSAI, are based on the Codex Alimentarius. The Codex was framed with the collaborative efforts of the World Health Organization and the Food and Agriculture Organization, two eminent United Nations health and food bodies. The Codex Alimentarius universal food principles, rules and codes of training add to the safety and quality of the food that reaches consumers. Since the FSSAI guidelines are confined to the regulations of the Codex Alimentarius, they adhere to international standards.

**2.4 Allergen Standards in Developed Countries:**
**1. Australia:** Most food allergies are caused by peanuts, tree nuts, milk, eggs, sesame seeds, fish, crustacea, soy, lupin and wheat. The Food Standards Code requires these foods to be pronounced on marks at whatever point they are available as fixings or as parts of food additives or processing aids.
On the off chance that the food isn't in a package or isn't required to have a label (for example, food prepared at and sold from a takeaway shop), this data should either be shown regarding the food or provided to the buyer whenever required.

Food entering Australia is dependent upon the Imported Food Control Act 1992. Under this legislation, imported food is reviewed and controlled utilizing a risk-based inspection program called the Imported Food Inspection Scheme, which is directed by the Department of Agriculture. Under the Food Standards Australia New Zealand Act 1991, FSANZ gives risk assessment guidance to the Department of Agriculture on foods that represent a medium to high risk to public health and safety (“The Allergen Bureau”).

Country of origin labels:

- regardless of whether the food is grown, produced, made or packed in Australia or another nation
- regardless of whether the food is a 'priority' or 'non-priority' food
- How the food is displayed to be purchased.

2. South Africa: The food business is monitored through various standards and regulations, including the Regulation Relating to the Labeling and Advertising of Foodstuffs (R.146). The packaged product must be labelled with the allergen label when the common allergen ingredients are in the product. If the food manufacturer is failed to control allergen cross-contamination in the manufacturing area or packaging area, they are required to put precautionary allergen labelling notice (may contain) on their products. The Common allergen is egg, dairy animals' milk, Goat milk, shellfish and molluscs, fish, peanuts, soybeans, tree nuts and cereals, as well as ingredients derived from these products that cause allergenicity in public health (AFSA).

3. Canada: Health Canada, the Canadian Food Inspection Agency (CFIA), allergy associations, and the medical community have recognized the key substances most regularly connected with food allergies and allergic-type responses. These substances are frequently alluded to as need food allergens. There are more than 160 foods can cause allergic-type of reactions in public with food allergies the law identified most common allergens of them that cause an allergic reaction to 90 per cent of people. Health Canada and CFIA have built up a progression of leaflets with data for consumers about every one of the priority allergens: Eggs, Fish, Milk, Nuts, Mustard, Peanuts,
Crustaceans, Molluscs, Sesame Seeds, Soy, Sulphites, Wheat and triticale are the most causing food allergies in public health.

A food producer that neglects to proclaim the presence of priority allergens and gluten sources on the label of a prepackaged food item could be in violation upon the Food and Drugs Act and the Safe Foods for Canadians Act — assuming this is the case, the item would be subject to enforcement measures which could incorporate a food recall. In Canada, the Canadian Food Inspection Agency is liable for authorizing appropriate food guidelines (Health Canada).

4. USA: There are eight major foods or food groups--milk, eggs, fish, Crustacean shellfish, tree nuts, peanuts, wheat, and soybeans--account for 90 per cent of food allergies.

The Secretary of Health and Human Services will lead investigations reliable with the authority under section 704 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 374) of facilities in which food products are produced, processed, packed, or held.

To guarantee that the entities operating the facilities conform to practices to decrease or dispose of cross-contact of food with residues of major food allergens that are not purposeful elements of the food and To ensure that main food allergens are appropriately labelled on food sources.

Importers can bring foods into the United States without earlier approval by FDA, as long as the facilities that produce, store, or generally handle the items are registered with FDA, and earlier notification of incoming shipments is provided to FDA.

Imported food items are subject to FDA investigation when offered for import at U.S. ports of entry. FDA may confine shipments of items offered for import if the shipments are seen not as in consistence with U.S. requirements. Both imported and locally produced foods must meet the equivalent legitimate prerequisites in the United States (FDA.gov, 2019).

5. UAE: The UAE took the accompanying measures to ensure food safety.

- Passed a law on food safety
- Introduced National Food Accreditation and Registration System
- Developed the National Rapid Alert System for Food
- Improved control for imported food products for non-trading purposes.

In January 2016, H. H. Sheik Khalifa receptacle Zayed Al Nahyan, President of the UAE approved the Federal Law No. 10 of 2015 on Food Safety. The law imposes regulations and guidelines for
keeping up the safety and quality of food and guaranteeing the protection of general public health and consumers. The law imposes strict punishments on those found to be endangering the safety of food over the UAE. A few parts of the food law are:

No food might be brought into the nation just because without the endorsement of the Ministry of Climate Change and Environment.

Those dealing in food products or items that contain pork or liquor or any of their side-effects without consent face a jail term of at least a month and a fine of up to AED 500,000. Misleading consumers by distributing a bogus labelling of food or utilizing incorrect labels will pull in a fine ranging from AED 10,000 to 100,000 (“Food Safety - The Official Portal of the UAE Government”).

6. Japan: The Japanese Food Authority considered the 27 food products on the list of specified ingredients containing allergens in Japan and they divided into two labelling classes they are mandatory and recommended.

In the first division, there are 7 Mandatory food items are Egg, milk, wheat, buckwheat, nut, shrimp, and crab.

In the second division, there are 20 recommended food items they are: Abalone, squid, salmon roe, orange, cashew nuts, kiwi fruit, beef, walnut, sesame, salmon, mackerel, soybean, chicken, banana, pork, matsutake, peach, yam, apple, and gelatin.

The Japanese government had considered the reference list of food allergens presented in the Codex general standard (Shoji et al.).

7. China: The TFDA has looked into allergen labelling guidelines from other nations, and nationally clinical reported allergic cases, to extend the labelling list from the current six allergens (shrimp, crabs, mango, peanuts, eggs and milk) to 11.

Organizations looking to import food to China first need to get from the government a license to import, a commercial license, and enrollment with the Certification and Accreditation Administration (CAA). Enrollments and licenses are valid for just four years. Some food items, for example, healthy food, meat, and dairy are dependent upon unique conditions and require special registration.
Upon shipment arrival in China, importers must give point by point documents describing the food quality, hygiene, labelling, packaging, inspection and examination. Precise documentation prerequisites differ among items and item classes, yet all shipments must incorporate approval documents, health certificates, quality review documents, and a nation of origin certificates ("Taiwan (China) Revises Its Food Allergen Labeling Regulations").

8. Singapore: All imported or locally manufactured/delivered pre-packed food available to be purchased in Singapore must be labelled with fundamental data, for example, name of food, ingredients, net substance and source. All business food imports that enter Singapore must prove food product country of origin. Moreover, just traders who are authorized or enlisted with SFA can get business shipments of foods (Singapore Government Singapore Food Agency). A permit is required when you are:
Importing, exporting or transshipping meat and fish items; or
Importing or transshipping fresh items of fruits and vegetables; or
Importing fresh table eggs

2.5. Food Regulations What is the Current Scenario in India?
Food products divided into two categories, they are standardized and non-standardized. The standardized food items are those for which guidelines are recommended and don't require product approval prior to manufacture, dealer, distribution, sale or import. The first time importer or manufacturer of standardized food products requires an FSSAI license to start a food business. Non-standardized food items don't have standards as their safety parameters are either not known or not yet found out. Currently, FSSAI has standardized only 380 articles of food in 16 classes so all different food sources require product approval in the event that they are not recorded among these 380 food products. FSSAI is working to standardize another 12,000 more food items for which the process is approaching conclusion in harmonization with Codex Alimentarius (Saurabh, 2015).
Traditional food products don't require product approval as they are being consumed for quite a long time in India. The ingredients and method of preparations are well known for many years.
and this ensures their safety. Assuming, be that as it may, traditional food utilizes any new ingredients or additives or new techniques for preparation, they need authorized approval. Food items Imported into India need to follow the FSS Act, Rules and Regulations If the food articles are standardized, the importers need an FSSAI permit to import them (Saurabh, 2015). The importers also need to conform to FSSAI standards available to be purchased and distribution of the food items. On the off chance that another or unknown food article is presented for import, it is considered non-standardized and requires item approval under Section 22 of the FSS Act, 2006. The FSS Act, 2006 doesn't need any significant approval to food products being sent out of India. Non-standardized food items, anticipating item approval, are examined for safety in four classifications (Saurabh, 2015).

2.5.1. Regulations for Licensing and Registration of Food Businesses in India:
There are two kinds of licenses: a central license, gave by the central government, and a state license, gave by any of the state governments. The central permit is given based on manufacturing capacity and turnover (Saurabh, 2015). Those operating food organizations inside an Indian state need a state license that is mainly based on limit or turnover. Food articles imported to India from other countries and conveyed in India need to conform to the FSSAI guidelines or suffer restrictions on import. The FSSAI likewise has stringent standards for packing and labelling under Food Safety and Standards (Packaging and Labeling) Regulation, 2011.

- Language on labels must be in English according to FSSAI Regulations, 2011.
- "Vegetarian" or "Non-Vegetarian" must be proclaimed by appending the image for "Vegan" or "Non-Vegetarian" on packages;
- Mention name and finish address of the merchant in India;
- Mention net weight or number or proportion of the volume of substance;
- Mention batch number or lot number or code number, and FSSAI permit number;
- Mention month and year in which the product is prepared or manufactured;
- Declare "Best Before" date on the package;
- Mention nutritional data or dietary realities per 100 grams or 100 millilitres for each serving of food item on the label;
- Name and address of the maker should be referenced on the label;
2.6. 14 Allergy Foods Listed in EU Legislation:

EU Legislation Listed 14 allergy-causing foods to public health they are:-

1. **Celery**: Celery stick used in salads and dips, celeriac used as mashed, roasted or fried and celery seeds or salts used in soups, sauces and drinks.
   **Risk**: Celery is a naturally available plant product causes food allergy and can also cause oral allergy syndrome, redness, itching, blistering around the mouth or throat *(Food Allergy & Intolerance: Guidance for the Catering Industry)*.

2. **Cereals Containing Gluten**: Gluten-containing food items are wheat, barley, oats, rye, spelt and Kamut. Used as bread, biscuits, cakes, pasta, pastry, pizza and as a thickening agent or blender.
   **Risk**: Cereals containing gluten causes an anti-immune reaction that damages gut in individuals with coeliac disease. The people who are gluten intolerant can cause bloating, pain and stomach upset.

3. **Crustaceans**: Especially includes crab, lobster, prawn, shrimp, langoustine and crayfish. Used in soups and in dishes such as fish pie and seafood chowder.
   **Risk**: Seafood can trigger severe reactions including anaphylaxis and even smell from cooking causes vomiting sensation *(Food Allergy & Intolerance: Guidance for the Catering Industry)*.

4. **Eggs**: Eggs from birds like hens, goose, duck, turkey and quall may be allergic. Mainly the white portion of the egg (albumen) cause allergy but in some people yolk also cause allergy. Used in dishes like cakes, mayo, sauces, omelettes, quiches, desserts including custard ice creams etc;
   **Risk**: Most of the children’s are allergic to eggs very common but many of them grow out of it by the age three and allergic reaction from eggs produce slightly to very severe including anaphylaxis.

5. **Fish**: Used in sauces, dishes like curry’s, toppings in wraps and pizza etc;
   **Risk**: Fish can trigger a severe allergic reaction and people who are allergic to fish causes vomiting sensation when they are being cooked. If a person is allergic to one fish species they
are allergic to all other species because all fish species contain mostly common protein (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

6. **Lupin:** Used as lupin flour and a gluten-free flour used mixed with other flours in pastry, cakes and lupin seeds added to bread.
   
   **Risk:** Lupin is related to peanut and soybean causes a similar allergic reaction.

7. **Milk:** The milk dairy products mainly causes two problems are lactose intolerance and milk allergy. Lactose intolerance is the body cannot digest milk sugar (lactose) and Milk allergy is an immune system reacts against the milk protein (casein). The main milk-derived products used are cheese, milk powders, ice creams, yoghurt, creams, ghee and buttermilk.
   
   **Risk:** Allergic reaction to milk is mild to anaphylactic but many of them grow out of it (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

8. **Molluscs:** They include mussels, scallops, oysters, clams, snails, whelks, squid and octopus. Used as served their own and in dishes like fish pie and seafood chowder.
   
   **Risk:** Molluscs can trigger a severe allergic reaction in public health and also cause anaphylaxis.

9. **Mustard:** It comes in a number of forms like sprouted seeds, leaves, flowers, oil and powder or flour. Used in curries, the coating on meat or fish products, salads dressings, sauces and marinades.
   
   **Risk:** Allergy to mustard in Ireland comparatively rare and it creates allergic reactions like skin irritation or gut irritation resulting in symptoms like eczema, heartburn or diarrhoea (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

10. **Nuts:** The tree listed in EU legislation are almonds, hazelnuts, walnuts, cashews, brazil nuts, pecans, pistachios and macadamia nuts. Used in breakfast cereals or cereals bar, cakes, biscuits, chocolates, pastries, bread, in Asian dishes including curries, desserts, dry fruit yoghurt, ice creams etc:
    
   **Risk:** Nuts can trigger severe allergic reaction including anaphylaxis.
11. Sesame: Mainly seeds, paste or oil. Used in bread, rolls, cakes, biscuits, tahini, hummus, halvah, stir-fries etc;
   Risk: Allergic reaction to sesame ranges from a slight rash to anaphylaxis (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

12. Peanuts: The common names for peanuts are groundnuts, earthnuts, ground peas, Monkey nuts. Used in baked cakes, pastries, chocolates, bread, salad dressing, fruit yoghurt, peanut butter, in Indian dishes, extracted oil from groundnuts used in cooking many parts of India.
   Risk: The initial signs of peanut-allergic reaction are a runny nose, itching mouth and throat, wheezing for breath, swelling of lips, throat or tongue, skin rashes, peanut allergy very common in children’s and may persist throughout life (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

13. Soybeans: Soy or Soya is a rich source of protein and vegetarians or vegans widely used in daily diet. Used as soy flour, tofu (bean curd), vegetable oil, soy sauces, emulsifier, etc;
   Risk: The allergic reaction of soybeans ranges from mild tingling around the mouth to anaphylaxis (*Food Allergy & Intolerance: Guidance for the Catering Industry*).

14. Sulphur Dioxide and Sulphites: Some people are intolerant or allergic to sulphites but they are essential to our health. They mainly used in food and drinks, as a preservative in meat products like sausages and beef burgers, wines, in raw potatoes chips, dried fruits and vegetables and sulphites includes sodium sulphites, sodium bisulphites, potassium bisulphite and metasulphites.
   Risk: Sulphur dioxide or sulphites may trigger asthma attacks and other allergic reactions are like skin rash and rarely anaphylaxis (*Food Allergy & Intolerance: Guidance for the Catering Industry*).
3. Measures to implement the food allergen standard in India and Ireland

The food safety authority of Ireland was established in the year 1998. The primary functions focus of the FSAI in Ireland is to ensure that the food produced and distributed throughout the market meets the highest standards in terms of nutritional value and hygiene.

1. **Food fortification:** Government of India has taken the initiative to raise the standard of packaged food. This process focuses on maintaining the standard of staple foods, especially on oil, milk, and flour. The food products are added with vitamins and nutrients to improve the content which does not have any adverse effect on the health of the consumers (FSSAI, 2018). The food fortification process has helped to maintain the standards of food and prevented health issues by increasing the nutritional values of the food.

2. **Food safety management system:** In recent years the food safety and quality of India have gone down, due to excessive use of chemicals and fertilizers. The government has incorporated the food safety management system which helps the country to develop *food processing* method that is used to decontaminate the food products and make them edible. Moreover, the food management system presides as the operative body that defines the quality of food in India (Fellows, 2017).

3. **Hazard analysis method:** In recent years the citizens are concerned about the nutritional data of the food, and the allergens present in the food. In order to prevent any diseases from food a hazard analysis method is applied by the food regulatory body of India (Arora, 2015). The hazard analysis method puts focus on chemical and biological hazards which possess a threat to the health of the consumers. Moreover, this approach puts focus on the hygiene of the food products are maintained. This approach ensures food safety, by providing certain guidelines to the producers and retailers. The guideline of the hard analysis critical control points *(HACCP)* approach has helped the manufacturer's producers and retailers to store their food product in a clean and well-protected area, which would help in retaining the nutritional value of food. this method helps the manufacturer to store their foods in a manner and prevents it from being contaminated, and prevents health issues.

4. **Good manufacturing practices (GMP):** The government has taken proactive steps in stopping the manufacturer from false labelling on their products. This process has stopped the manufacturers from misleading consumers, by not disclosing the harmful ingredients that are present in their products (de Oliveira 2016). Good manufacturing practice is a business tool that
helps the producers to have a fair business. This method also helped consumers to avoid the food products that have allergens.

The above discussion states that both the countries have applied a few approaches which have helped to maintain the food standards. The approaches of Ireland are more effective as they tend to eradicate the potential threats of food poisoning (Hernández-Cortez et al., 2017). The main problem in maintaining the food allergen standards in India is maintaining appropriate hygiene of the food products to prevent diseases. The Ireland government has implemented certain strategies in their regulatory body which prevents them from doing trade of contaminated food products, in order to prevent mass food poisoning in the country. The strategies implied by India has helped the country develop local regulatory authority which has helped the consumers as well as manufacturers to have a clear understanding of the allergens which cause health issues. The strategies have also helped to maintain the food regulatory standards of the country.

5. Allergen management team: Gathering a highly qualified and responsible allergen management team is one of the fundamental steps in developing a successful plan for allergen control. The team will create techniques and develop procedures as per the allergen control objectives and policies, they have to assess and recognize the safety and risk associated with possible food allergens and afterwards utilize different ways to reduce the food allergen risks (An Update on Food Allergen Management and Global Labeling Regulations Xinyu Diao).

6. Ingredients receiving, handling and storage:
Ingredients receiving personnel are responsible for the inspection of all ingredients and make sure they carry correct labelling and make sure cross-contamination with the broken packages. The delivery vehicles must be inspected after unloading to eliminate cross-contamination. After proper inspecting the documents of allergen-containing ingredients, transportation and storage of these ingredients in the specific allotted area to minimize the risk of cross-contamination with other ingredients. Store allergenic ingredients and non-allergic ingredients in separate areas or store allergenic ingredients underneath non-allergic ingredients when the capacity region is small. Different colours used in a colour-coded system to mark high-risk areas and low-risk areas to eliminate risk and this colour-coded system is widely used in different facilities (An Update on Food Allergen Management and Global Labeling Regulations Xinyu Diao).
3.1 Trends in food allergen management

The detection of the allergens in the food is very hard and so, there should be some methods which could find out the allergens. There had been a continuous change in the analytical methods and detection capability of the allergens in the food. Alves et al. (2015) identified that a mere detection of the food allergens at trace levels will not do good but rather risk management should be applied to improve the food allergen detection. The global food allergen testing market is expected to grow by 6.8% within 2022 and therefore, there had been new technologies to solve out the problems (Yeung and Robert, 2018).

Jayasena et al. (2015) stated that the ELISA is used to detect the allergens in the food. The advantage of this technology is that the entire process is simple and highly economical. The analysis through this process is highly selective and that is why it is expected to grow in the upcoming years. However, the problem in the process is that as this technique is cost-effective, so, there are a lot of errors in the tests. The tests presented erroneous results in cases when these tests had to be applied in highly processed food. In order to improve the problems faced during the tests, some methods like the inclusion of the surfactant and reductant to yield better outcomes in the overall examinations.

![Figure 1: ELISA test to detect the food allergens](Source: Jayasena et al. 2015)

Another tool that is used in the food allergen measurement is the lateral flow device (LFD) which gives the results quite quickly. The advantage of the test is that they are performed on the site and
this helps in making the allergen management in food companies much better. Allen et al. (2014) suggested that the use of multianalyte profiling technology could create a proper assay which helps in detecting the 15 different allergens in the food along with the presence of gluten. However, the main problem of this system is that there could be cross-reactivity and is not able commercially. In Ireland, it is seen that the precautionary allergen labelling (PAL) is used which states that it might include the allergens. The main problem in the PAL is that it might create a huge confusion for the consumers where they often reject some of the items which are often not allergic. Shaker and Greenhawt (2018) observed that 11% of the 106 variants of food used to contain some kind of allergens that were not in the list and the PAL is not vital for the food management practices. Holzhauser and Röder (2015) claimed that the PCR (polymerase chain reactions) methods had been used to detect the allergens but there is no single assay depending on which the results could be derived. The approach is not suitable in detecting the allergens as it depends on the DNA fragmentation. India uses PCR tests to detect the presence of the allergens in the food and verify if there is any gluten in it. However, the technique used in it could not differentiate between the allergens in the egg and white as both are dairy products. On the contrary, Salihah et al. (2016) claimed that Ireland had been able to use this method in detecting the allergens properly with the help of RTPCR (real-time polymerase chain reactions). RTPCR is an improved version of the PCR. With the help of this method, a better DNA or RNA quantification could be done. However, as this method is a new technique, so, there could be some glitches in it and should be addressed as fast as possible. The advantage of the process is that the detection steps are better as compared to that of the PCR technique.

3.2 Challenges in food allergen management

Food safety had been regarded as one of the main issues in today’s world (Van Asselt et al. 2016). This had been increasing grounds due to the recent cases on the toxic effects of certain foods. As a result of the toxic effects in the foods, there is an abnormal reaction due to ingested food. The abnormal food reaction had led to cases like hypersensitivity, food intolerance and many more. Although there had been certain steps in improving the health of the people, there are some problems which are more alarming to them. Sicherer and Sampson (2018) founded that food allergy could be manifested by genetics and the environment. The combination of genetics and the
environment lead to allergies. Other factors like sex and ethnicity also contribute to the growth of food allergens.

![Figure 2: Sources of allergen contamination](Source: Allen et al. 2014)

Some challenges that come in the way of a proper food allergen management is that there are no proper labelling standards in this process (Fenko et al. 2016). The lack of information present in the food manufacturers lead to the wrong labelling and often, the consumers try to consume it without any thinking. As a result of the mislabeling, the consumers consume the foods that could lead to lethal conditions. In addition, the workers in the food management process and poor manufacturing process in it led to the ineffectiveness in managing the food allergens. Dzwolak (2017) stated that food allergen management is very important in the food industries but confusion among the different national regulations could create some problems. There is a huge dilemma in the allergen requirements as every nation follows a different format.
The lack of uniformity within the allergen labelling requirements in various countries lead to a huge confusion for the food exporters and this hampers the cross-border trade. Zurzolo et al. (2015) suggested that the food exporters should have good knowledge of the different allergen labelling requirements in the importing nations. Although Ireland possesses an allergen labelling regulation where it recognizes 14 allergens in the food. However, India does not possess an allergen labelling regulation and this had created huge problems for the South East nation (Allen et al., 2014). The main problem in India is that it does not have a proper allergen labelling requirement until now. There are some foods which are not considered to be allergen active products by Ireland but are allergen tolerant in India (Bhattacharya et al. 2018). Even, chickpeas and brinjals are found to trigger allergic reactions.

3.3 Strategies to improve food allergen detection standards

The PAL used in the food allergen detection methods is quite ineffective as it depends mainly on the DNA fragmentation. This is the reason, the results coming from the DNA fragmentation of the eggs and milk are quite similar as both are dairy products. The labelling process under the effect of PAL is quite improper and this might damage the mannerism of detecting the allergens in the food. Allen et al. (2014) claimed that the VITAL initiative used by the Allergen bureau of the
Australian food industry helps to present the results on a transparent basis which is used by the manufacturers. The advantage of the VITAL is that it helps in detecting about 99% of the allergens in the food.

Nitride et al. (2018) stated that the regulations in the food allergen detection had been done to improve the hygiene in food which are involved in retailing and wholesaling of the food. The amendments like the EU Regulation No. 1169/2011 forces the food businesses to give sufficient information on the food allergens. The changes made in the food labelling standards given in the IS 341 forces the food companies to give information to the consumers as per the FIC regulations (NSAI, 2019). There had been some changes in the IS 340, where the food allergens should be detected in the caterings sector so that the hygienic environment is maintained.

Bansal et al. (2015) founded that the foods that would be imported into Indian markets had to follow the FSSAI Act 2006. As per Section 22 of the FSSAI Act 2006, there had to be some changes in the allergen detection process where some warning signs should be given to the consumer products. One of the changes that had to be included in the presence of the warning symbols would help the customers to know the presence of the allergens in the food and would make them aware of the potential threats (Tewari, 2016). However, as per the Codex Alimentarius, there are no provisions for the warning levels in the Indian regulations. This would affect the consumption culture in the foods used by the people. The situation looks promising in Ireland due to the active participation of the governmental authorities but in case of India, the political system and the regulatory bodies’ inefficiency led to the poor detection standards of allergens used in the food.

3.4 Concentrations of allergenic foods/ingredients in edible items (In Ireland)

According to the food safety authority of Ireland, the EFSA Panel on Nutrition, Dietetic Products and Allergies (NDA Panel) have announced evaluation of food ingredients and allergenic foods to the label on a scientific manner (EFSA, 2018). As amended on Annex IIIa of 2003/89/EC, an update on NDA panel was decided on food ingredients with known allergenic potential. Eggs, milk, fish, molluscs, dairy products, peanuts, cereals that contain gluten, soy, mustard, nuts, sesame, celery, sulphates and lupus are some of the products that may contain allergenic substances. The idea relates to the non-Ige-mediated and immunoglobulin food allergy, to an adverse reaction to foods in sulphites and coeliac disease that does not address the nation- an
immune-mediated adverse reaction to food. The Food Safety Authority of Ireland requests the EFSA panel on products like dietetic, on the request the Nutrition and Allergies panel (NDA) deliver a scientific-based opinion on the evaluation of food ingredients and allergic foods for the purpose of labelling. Moreover, the EFSA has launched a project (CT/EFSA/NDA/2012/02) to gather adequate data on food allergy in Europe for the general population (EFSA, 2014). The average consumption of sulphite containing foods estimated approximately 20 mg to 50 mg, but in some individuals variability is high. The EU panel approved the mandatory labelling for sulphite containing foods in concentration > 10 mg/kg or 10 mg/L which was based on LOD detection method (EFSA, 2014).

The concentration on allergic food ingredients in Ireland has not developed any risk in the majority of consumers than attracted attention much more from industry, regulatory bodies and consumer association. There are plenty of methods for the quantification and detection of food allergens to ensure compliance with food labelling regulations. Various approaches have been designed to analyze the existence of allergic ingredients in food items. Depending on the detected allergenic contaminants on food products, the technological treatment and matrix treatment are applied respectively. The selected methods first need the targeted selection and identification of the analytics.

The physicochemical (notably MS) and immunological (especially ELISA) methods are the most common analysis of proteins performed. The DNA analysis is primarily based on the amplification of specific DNA fragments utilizing PCR and specific primers. The most commonly used methods for detecting the presence of allergens on edible items is the PCR methods.

The PCR methods are based on different various approaches that have been developed simultaneously by detecting several allergens in the food items. This system not only saves time but also the resources that are designed and validated carefully. A real-time PCR duplex is a simultaneous discovery of hazelnuts and sesame in spiked food down to 0.005% has been processed (schoringhummer et al., 2009). Also, the qualitative method of duplex real-time PCR for simultaneous detection of soy and lupin mitochondrial DNA with a 2.5 mg/kg of LOD has been developed in the process (Gomez Galan et al., 2011). Simultaneously two tetraplex PCRs has developed for the detection of eight allergenic food products namely egg, peanuts, celery, soy,
sesame, milk, almond and hazelnut with sensitivity and specificity at the range of 0.01 % (Koppel et al., 2010). There are relatively two quantitative hexaplex real-time PCR systems for the process of quantification and detection of twelve allergic food ingredients. Moreover, Gomez Galan et al., (2011), opined that the first system defines the DNA of hazelnuts, cashews, celery, mustard, peanut and soy, on the other hand, the second system DNA determines the almonds, sesame, walnut, egg, pistachio and milk.

3.5 Effects of food processing on allergenicity (From the perspective of Ireland)

Food is being processed in restaurants, home and institutional settings by the food organization. As mentioned by Monteiro et al., (2017), food ingredients and food both the items go through various treatments to enhance their initiative, palatability to enact pathogenic microorganism to ruin the toxins. The chemical properties and structure of proteins are determined by techniques in food processing. The main modifications must consist of proteolysis, aggregation and unfold, ph. effects, glycation and glycosylation, networking and solubility to know information that may alter its allergenic potential (Paschke, 2009). to some extent the protein is being modified by the food processing depended on composition on matrix, process condition and nature of the protein.

The food processing of an allergic complex food may decrease or increase or remain unchanged in the activity. It is difficult to predict the impact of allergenic properties and structural food processing on allergic food products. However, Monteiro et al., (2017), mentioned that the multiple considering of allergenic food structures containing different proteins in a portion of whole food that may affect differentially. Moreover, the effects of food processing on IgE-binding capacity of allergens, specifically does not predict on the allergenicity of the qualified food for the allergic patient community.

In the context with this section, overall methods of food processing and their effective effects on potential allergenic foods. The effects on food processing that are available on the report of IgE-binding capacity of foods than on their allergenicity (Verhoeckx et al., 2015). Under the allergenicity control of the condition, the systematic investigations on food processing allergenicity are scaring. The alternative specification of the food processing ingredients consists of the amendment of Annex IIIa Directive 2003/89/EC, noted in the dedicated sections.
The possible effects on the allergenicity of food processing and derived products possess the different allergenic potential of soy products that include soybean oil and lecithin. Fermentation, storage, high-pressure processing (HPP) and heat treatments affect the LgE-binding activity that is obtained from soy-allergic patients and peanuts.

Tropomyosin is a heat resistant element, but some non-tropomyosin mollusc allergens may be destroyed by heat (Yazdi et al., 2010; Shen et al., 2012). The overall allergenicity of mollusc is not reduced reliably by high temperature. The high temperature may cause an increase in allergenicity of molluscs (EFSA, 2004, 2006b), in some cases. On the learning on scallop tropomyosin (Nakamura et al., 2005), the recognition of Maillard reaction as a mechanism by which the capacity of LgE-binding may increase by high temperature.

The sesame seeds that extract protein are prepared by using various conditions (NACI concentration, ph.) which shows different immunological responses (Achouri and boye, 2013). The higher immunoreactivity isolates the lower salt concentration (0.2M Na) in comparison with the higher extracted salt concentration (0.6M and 1M). The heat treatments (from 100 MPa to 500 MPa) has marked the antigenicity of sesame allergen decreasingly. The thermal process like boiling and dry roasting help to increase the antigenic responses.
3.6. Management and Control of Allergens:

3.6.1. Food Recall Plan (India): All food business administrators as described in the Food Safety and Standards (Food Recall Procedure) guidelines 7 and regulations, 2017 must have up to date food recall procedure as given in Annex (Model review Plan)- I. At the period of recall being carried out, the FBO will present their detailed recall procedure to the CEO, FSSAI.

- Assemble the Recall Management Team
- Notify the authority
- Identify all products to be recalled
- Detain and Segregate all products to be recalled which are in your firm's control
- Preparing and distribution of the information of recall including Press Release
- Prepare the Distribution List
- Verify the effectiveness of the recall
- Control the recalled product(s)
- Decide what to do with the recalled product(s)
- Fix the problem cause of the recall if the problem occurred at your facility

Figure 4: India Food Recall Plan

GUIDELINES FOR FOOD RECALL, 2017
3.6.2. RASFF Legal Basis (EU): The legal basis of the RASFF is Regulation EC/178/2002 setting out the general standards and prerequisites of food law, establishing the European Food Safety Authority and setting down strategies in issues of food safety (O.J. N° L 31 of 1 February 2002). In Articles 50, 51 and 52 scope and methods of the RASFF are described.

Figure 5: Rapid Alert System Food and Feed (EU)
(RASFF Legal Basis)
4. AIM AND OBJECTIVES

4.1. AIM:
The main aim of this study is to identify the food allergens standards from various countries such as India, and Ireland. This would directly help the researcher to understand the different rules and regulations associated with these countries in relation to food safety management.

4.2. OBJECTIVES
The objectives of this research are as follows:
- To evaluate the standard associated with food allergens
- To identify the food allergens standards of India and Ireland.
- To compare these standards in order to identify the best approach towards the safety of food management.
- To recommend best strategies that can be used to improve the food allergens standards among these countries.

4.3. Research questions
- What are the different standards associated with food allergens?
- What are the food allergens standards of India, and Ireland?
- What are the differences between the food allergens standards among these countries?
- What recommendations can be provided such that the food allergens standards can be improved?
CHAPTER 2; METHODOLOGY
Introduction

The research methodology is an important part of the study that helps to establish a strategy, best approach, philosophy of research and methodology components. Different research approaches have been viewed to meet the aims and objectives in order to determine the strengths, weakness and decide the selection of best approach. The author selected a quantitative research methodology in order to meet the guidelines of the dissertation. The study also suggests that the comparison of food allergen in India and Ireland; this can be checked on the basis of demographic aspects (such as gender, age, place of residence) which are believed to have an impact. Therefore, it is presumed that the participants would be honest in their answers on the basis of the privacy and confidentiality offered in the conduct of the ethics guidelines, also because the participants can quit or withdraw from the survey at any time if they do not feel comfortable responding, in addition, because the respondents were explicit about the significance and intent of the study.

2.1. Research design

A questionnaire was developed as a closed questionnaire of multiple questions aimed at testing the general public in India and the Republic of Ireland (ROI). The entire questionnaire was comprised of 8 multiple-choice questions. It was divided into two sections. The first section demographics of the individuals being surveyed, such as gender, age, place of residence. The second section consists of knowledge of food allergen, food allergen prevention standards and current food allergen management systems in India and Ireland.

2.2. Targeted participants

The target participants of the study were of the common people that resided in India and in the Republic of Ireland, with the restrictions that they had to be over the age of 18, speak English in order to understand the survey, to test the knowledge in how what they think is appropriate or correct in terms of food allergen systems.
2.3. Data collection and Questionnaire Design

An online questionnaire survey was chosen because of its speed, global reach, flexibility, takes less time to get responses, control of answer order can collect a huge number of samples and ease of analysis and data collection. The participants' sample was clarified with the research purpose and their full confidentiality was covered by the Technological University Dublin ethical guidelines to ensure the importance of accuracy in their answers. Participants were approached by an electronic link to the survey was issued for their participation and completion; the electronic link was filled either on the spot or at their own convenience and time; using survey monkey. The tool for survey chosen to design the questionnaire was Survey Monkey because of its popularity and user-friendliness. Survey Monkey is one of the best tool and high popular tool among the Google forms, Survey Gizmo, Survey Planet, Client Heartbeat and Zoho Survey. In order to assure coverage in multiple areas on the republic of Ireland and India, the same method was conducted in multiple of the major demographics of the Republic of Ireland and India. Each and every question was designed to meet the objectives of the Literature Review.

2.4. Data Analysis

With the help of Excel software, datasets were analyzed and generated. Based on the gathered information, all the results are generated. The conducted survey has eight questions. The survey's entire knowledge section and each subsection were analyzed for their mean score and standard deviation. After calculating the correct, incorrect and missing answers for each participant, the participants who responded correctly to more than half of the survey questions would have obtained a pass, in addition, the passing rates were also analyzed for each subsection and demographic group.
CHAPTER 3; RESULTS AND DISCUSSION
3.1. RESULTS

In the course of the survey, primary data have been collected from 95 research respondents who have been selected based on convenience sampling. The survey questionnaire was spread across social media which made it easier for the researcher to appeal across various demographic groups. The primary objective is to analyze the food allergen as well as preferences of the food consumer. The survey had primarily been conducted across Ireland and India. Respondents were asked to describe their gender for the survey and do they check allergen label on the food products? Out of which 56% of the respondents were male and 39% of the respondents were female. 36% of the total respondents checked allergen label on the food products and rest 59% of respondents did not.

3.1.1. Response rate:-

1. Age:

Out of total 95 responses, 75% of the respondents were in the age between 18-25, 18% of the respondents were in the age of 26-35 and 2% of the respondent's in-between age of 36-49 years old.

![Figure 6: Age](image-url)
2. Gender:
The total number of male participated in the survey were 60% and 40% were female out of 100 participants.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>56%</td>
</tr>
<tr>
<td>Female</td>
<td>39%</td>
</tr>
</tbody>
</table>

Table 1; Gender

3. What is your country?
Respondents were asked for which country you belong to? 95% of the respondents answered are belongs to India because the survey mostly concentrates on India respondents.

4. What do you consider the most important food allergen is?
Out of 95 responses, half (50%) of the respondents did not know what food comes under allergen whereas 45% of the respondents answered allergen food such as eggs, fish, celery, mushroom and peanut.

Figure 7; Allergens
5. **Do you check allergen label on the food product?**

Respondents were asked do you check allergen food label on the food product while you buy food from the store or while shopping? Responses collected were 36% of the respondents answered as ‘yes that they do check food label and 59% of the respondents don’t check the food label on the food product.

![Figure 8; Allergen label](image)

"Allergen Label"

36% Yes
59% No
6. **How many members of your family are suffering from a food allergen?**

Respondents were asked how many members of your family are suffering from a food allergen, responses were 15% of the people had one member suffering from food allergy, 6% of the people had two members suffering from food allergy, 5% of the respondents had more than two members in the family suffered from food allergy. 69% of the respondents had no member suffering from food allergy.

![Number of members suffering food allergy in family](image)

**Figure 9; Number of Members Suffering Food Allergy in your Family**
7. To what extent do you think that food allergen prevention standards are quite effective? Below figure presents what respondents think about the food allergen prevention standards? Are they quite effective? More than half (56%) of the respondents think that standards are quite effective, 24% respondents strongly agreed on food allergen prevention standards are quite effective, 10% respondents disagree to the food allergen prevention standards and 5% of the respondents strongly disagree the food allergen prevention standards are quite effective.

Figure 10; Food Allergen Prevention Standards

n = 95 Respondents, Where “n” is the total number of respondents
8. Are you satisfied with the food allergen management in your country?
Respondents were asked are they satisfied with the current food allergen management in their country? 46% of the responses are satisfied with the current food allergen management whereas 49% of the respondents are not satisfied.

Figure 11; Food Allergen Management in your Country?
3.2 DISCUSSION:

To meet the guidelines of the dissertation an online survey was conducted with the designed questionnaire. The sample size is described as the determination of action in order to select multiple examinations inside a statistical sample. In order to provide better results related to the complexities of food allergen, collected a total of 95 respondents from India. The questionnaire is designed to age group above 18 because to get accurate responses from grown-up people. According to survey 18 to 25 age group people take an active part in the survey got 75% respondents and 26 to 35 age group are 18% respondents and 36 to 49 age group are 2% respondents out of 95% respectively. The second question in the survey is what is your gender? This question is designed because to analyse which gender is more knowledged towards food allergens. According to survey results, 56% of respondents are male and 39% of the respondents are female. The male respondents in India are actively participating in this survey. The fourth most important question in the survey is what do you consider the most important food allergen is? On the analyse of survey results 50% out of 95% don’t know what are the food allergens and 45% are answered fish, mushroom, eggs, celery and peanuts. Food allergen is one of the major problems in India because there is no official legislation and standards. The main problems that are affecting in this country are food handling and allergen labelling. Next to the fourth question is, have you checked allergen label on a food product? 36% of respondents check the label on food product because they answered yes and 59% of respondents don’t check allergen label because they answered no. The people who suffer due to various food allergies need to keep away from packaged and processed foods because Indian food brands do not label allergen information. Some experts in India suggesting to public alternative ideas like to choose international brands furnished with allergen labelling but the cost of these products are high and available only in metropolitan cities. The questionnaire is designed on how many members of your family are suffering from a foods allergy? None of the 69% out of 95% of the respondent family members are not suffering from food-related allergies, one family member in each 15% respondents suffered from a food allergy and two members in each 6% respondents, more than two family members in 5% of respondents. Indian people use the traditional way of cooking uses a number of food items in dishes or curries compared to Ireland and those who were allergic to certain food item they avoid eating that food item life long. The questionnaire is designed to what extent do you think that food allergen prevention standards are quite effective? For this question 24% Out of 95% strongly
agrees to food allergen standards are quite effective, 56% of the respondents are agreed, 10% and 5% disagree and strongly disagree because most of the Indian people don’t have knowledge on food allergens and Irish people are well knowledged towards food allergens. The final question in the survey is are you satisfied with the food allergen management in your country? Out of 95%, 46% are satisfied but there is no food allergy legislation in India and 49% are not satisfied. Although, the Indian government has a governing body, named FSSAI, which regulates the safety and food standards within the country this body is not interested in maintaining the hygiene of the foods. However, Ireland had a dedicated governing body of FSAI which presides over the quality and standard of food. The Ireland government had passed strict laws to stop any further consumption of allergic foods and if this stuff is found to be containing an allergen, then the license of the company would be stripped.
CHAPTER 4; CONCLUSION AND LIMITATIONS
4.1 CONCLUSION:

Food allergen standard is an essential part of the food safety measure but in a country like Ireland and India where it is not maintained properly. Ireland is facing some glitches in its implementation while India’s food safety regulations are still immature to have maximum effect. Another issue that India is suffering from is the diversified culture where there are multiple languages and in such a scenario, it is very difficult to make a good implementation. Although, the Indian government has a governing body, named FSSAI, which regulates the safety and food standards within the country. The governing body is not developed well with the hygiene of food products. However, Ireland had a dedicated governing body of FSAI which presides over the quality and standard of food. Due to the active participation of government, it had become mandatory to display the information of the nutritional values of all the food products while in India, only packaged products are being focused. Even, the manufacturing practices in India, as well as Ireland, are completely different. The Ireland government had passed strict laws to stop any further consumption of allergic foods and if this stuff is found to be containing an allergen, then the license of the company would be stripped. However, in India, there is no proper communication between the manufacturers and suppliers regarding the food allergens and this is affecting the way of doing business.

The lack of knowledge in the public suggests that most of them do not know if the food processing would have any effect on allergen treatment. This is why they do not know if the overall allergenicity of mollusc would be reduced reliably by high temperature. The process of heat treatment in the food processing had a huge effect on the sesame allergens which changes the antigenic responses. The rules and regulations in the Codex Alimentarius do not reflect any strict warning signs for the food manufacturers due to which the allergic incidents are increasing in India. The positivism research helped to know the insight of the customers through an online survey. In order to make the study better, a sample size of 95 people collected from India citizens which helped to frame their insights into valuable results.
4.2 LIMITATIONS:

The Food Safety Authority of Ireland conducted a survey on food allergy precautionary labelling and the results of a survey show that some 94% of foods with precautionary allergen labelling did not contain the detectable levels of the allergen which are mentioned on the label. The FSAI states that food manufacturers are labelling a high level of unnecessary precautionary labels.

On the other hand, in India, there are no mandatory labelling regulations of food allergens on the label and there is only labelling for nutritional declaration. Through this study, the Indian government’s impact on the allergen regulation had not been found and this had created a problem in doing research. According to survey many of public suffering with food allergy with at least one of the common foods. Present on public health concern the Codex Alimentarius and Food Safety and Standard Authority of India developing regulations and standards on food allergen labelling.
CHAPTER 5; JOURNAL ARTICLE, REFERENCES AND APPENDIX
5.1 JOURNAL ARTICLE:

- **Abstract**

On evaluating the food safety standards of India and Ireland regarding the food allergen, it had been identified that improper labelling and packing are the major issues of these countries. Food management authority plays an important role in maintaining the safety standards of these countries. Some of the common food allergens of India and Ireland are shellfish, crustaceans, egg, fish, milk. Peanuts, soy, tree nuts, sesame, mustard, among others. There are different areas where food standards can be effectively managed in order to minimize the food allergen such as Raw material management, Handling, transport and storage during segregation and Management of product information, receipts and labels. The survey analysis considered middle-aged and young people in India because they are more health-conscious. To understand the prospect of the respondent many questions had been asked to them by the researcher.

- **Introduction**

Food allergen is considered as one of the important parts of the measures related to food safety. On the other hand, it has been observed that food allergen standards were not maintained properly in countries like India. The report had discussed the issue of food allergen, in India and Ireland, which is considered as the major issue of these countries (Mee, P., 2019). The implementation of (EC) No 1169/2011 also brought major changes on the labelling prepacked products of nutrition. Many organizations are aware of the nutrition label; therefore, some small changes will not be costly, difficult or time consuming for them (Gruenfeldova, Domijan and Walsh, 2019). It has highlighted the issues India is facing while implementing the food safety standards. On the other hand, the report has identified the food allergen standard of India is not mature enough to have an effective impact. In addition to this report has also identified that the implementation of food allergen standard is difficult in India because it is a diversified country with many cultures and many food habits Bose *et al.* (2016).

In the book “Living with Food Allergies” Author says, "With a populace of well over a billion, food allergy could turn into a huge issue in India. Up to 3 per cent of Indians may as of now have food sensitivities, most of these under 40 years old. The Author added that food allergies cause
about 30,000 emergency treatment and 100 to 200 deaths for every year in the country and up to 3 million Indians have peanut allergic reaction approximately. (“Food Allergies on the Rise”)

In the study, it has been identified that product labelling is one of the major issues in the context of food safety in a country like India. The report has highlighted that food organizations in India are not providing the proper information regarding food allergens in the labelling. As per the study, it has been observed that this type of labelling provides wrong information to the customer which may lead to severe health issues.

• Methods

The overall research has focused on food allergen and safety standards issues. The study has suggested a different theoretical framework to mitigate these issues. Food allergen issues can only be mitigated through the proper implementation of food safety standards. In European Union, there are 14 common food ingredients that must be declared as allergens on the label they are, cereals containing gluten, crustaceans, eggs, fish, peanuts, soybeans, milk, nuts, celery, mustard, sesame seeds, sulphur dioxide and sulphites, lupin and molluscs. The main issue is in India there is no official mandatory labelling on food allergens and public-facing health problems due to lack of knowledge and control on food allergens by the food safety and standard authority of India (FSSAI).

The PAL used in the food allergen detection methods is quite ineffective as it depends mainly on the DNA fragmentation. This is the reason, the results coming from the DNA fragmentation of the eggs and milk are quite similar as both are dairy products. The labelling process under the effect of PAL is quite improper and this might damage the mannerism of detecting the allergens in the food. Allen et al. (2014) claimed that the VITAL initiative used by the Allergen bureau of the Australian food industry helps to present the results on a transparent basis which is used by the manufacturers. The advantage of the VITAL is that it helps in detecting about 99% of the allergens in the food.

In recent years the citizens are concerned about the nutritional data of the food, and the allergens present in the food. In order to prevent any diseases from food a hazard analysis method is applied by the food regulatory body of India (Arora, 2015). The hazard analysis method puts focus on chemical and biological hazards which possess a threat to the health of the consumers. Moreover, this approach puts focus on the hygiene of the food products are maintained. There had been a
continuous change in the analytical methods and detection capability of the allergens in the food. Alves et al. (2015) identified that a mere detection of the food allergens at trace levels will not do good but rather risk management should be applied to improve the food allergen detection. The global food allergen testing market is expected to grow by 6.8% within 2022 and therefore, there had been new technologies to solve out the problems (Yeung and Robert, 2018). Jayasena et al. (2015) stated that the ELISA is used to detect the allergens in the food. The advantage of this technology is that the entire process is simple and highly economical.

- **Result and analysis**

According to the report of the conducted survey by the researcher, most of the respondents in India do not know about the food allergens. The survey has been conducted on middle-aged and young people because this age group is very cautious in the context of food habits. The researcher has identified that out of 95, 56% of the Indian respondents have agreed with the food safety preventive standards are quite effective and 24% are strongly agreed for that. On the other hand, 46% out of 95% Indian respondents has said that their nation is taking effective steps to maintain certain food safety and remaining 49% of the respondents are not happy with food safety management in India. The survey mainly targeted Indian respondents because there to know accurate public response and effectiveness of Food Safety and Standard Authority of India in public. The survey has highlighted that 69% out of 95% of respondents have said that their family had not faced the problem of hypersensitivity. In India, most of the people are suffering from common food allergens they are Milk, eggs, seafood, etc;
Q. What do you consider the most important food allergen is?

<table>
<thead>
<tr>
<th>Allergic Food</th>
<th>Number of Respondents</th>
<th>Total Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seafood</td>
<td>18</td>
<td>95</td>
</tr>
<tr>
<td>Mushroom</td>
<td>4</td>
<td>95</td>
</tr>
<tr>
<td>Nuts</td>
<td>7</td>
<td>95</td>
</tr>
<tr>
<td>Milk</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Eggs</td>
<td>8</td>
<td>95</td>
</tr>
<tr>
<td>Celery</td>
<td>1</td>
<td>95</td>
</tr>
<tr>
<td>Gluten</td>
<td>2</td>
<td>95</td>
</tr>
<tr>
<td>soya</td>
<td>1</td>
<td>95</td>
</tr>
<tr>
<td>Brinjal</td>
<td>3</td>
<td>95</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>95</td>
</tr>
</tbody>
</table>

Tabel 2: Allergens

For this question, 50 respondents are combined skipped and answered I don’t know. In India half of the people don’t know what are food allergens according to the survey results.

Food allergen is considered as the major problem in the country like Ireland and India. The main concerns in the context of food allergens for these countries are allergen labelling and food handling. The allergen standards which are available within these nations make it quite difficult for the food restaurants to function. In Ireland, allergen labelling gets top priority in the context of food safety but for India, there is no such strict regulation regarding the food labelling. One of the primary issues of food allergens in India is that India people do not have appropriate knowledge regarding the matter. There are more than 160 foods are considered as the cause of food allergies because most of the allergy cases were not reported. These unreported food allergens may cause dangerous health issue to the individual. Majority of the population is worried regarding the improper standardization in India in the context of food safety. Contradictory to this report has highlighted the Ireland government more active in comparison to Indian government because In Ireland every medium and small industry also knows about the nutritional value of every food they are producing or packaging. India falling Codex Alimentarius guidelines and standards but
Codex not taking any serious action to implement food safety allergen standards and many of India products facing border rejection because of lack of allergen labelling. India has to implement allergen label standards for the safety of public health.
5.2 REFERENCES


Food Allergy & Intolerance: Guidance for the Catering Industry.


GUIDELINES FOR FOOD RECALL. 8 Nov. 2017.


“VITAL ® Voluntary Incidental Trace Allergen Labelling| Allergen Bureau.” The Allergen Bureau, 2019, allergenbureau.net/vital/.


5.3 APPENDIX:

- **Research questions**

1. What is your age?
   - 18-25
   - 26-35
   - 36-49
   - Greater than 50

2. What is your gender?
   - Male
   - Female

3. What is your Country?.................

4. What do you consider the most important food allergen?..............................

5. Have you checked allergen label on a food product?
   - Yes
   - No

6. How many members of your family are suffering from a food allergy?
   - None
   - One
   - Two
   - More than two

7. To what extent do you think that food allergen prevention standards are quite effective?
   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

8. Are you satisfied with the food allergen management in your country?
   - Yes
   - No