



AMERICAN UNIVERSITY OF BEIRUT

FOOD ALLERGEN LABELING: A CASE OF LEBANON

by  
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submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
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# ABSTRACT OF THE THESIS OF

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The epidemiology of food allergies appears to be increasing worldwide. To help people suffering from food allergies, different international labeling standards were developed to include the list the major food allergens that cause allergies and intolerances on the labeling of packaged foods.

Our aim was to assess the characteristics of allergen labeling and consumers' knowledge, attitudes, and purchasing habits of food products with allergens in Lebanon. Allergen labeling of 1000 supermarket food products were evaluated and random sample of 541 consumers were recruited through an online survey posted on social media platform. A structured IRB approved survey including three different sections was administered as a tool of assessment.

Wheat represents the largest group of food allergen declared in labels, followed by milk and soybean. Different types or emphasis were used to inform consumers about presence of allergens. Furthermore, 42.9% made use of precautionary allergen labeling with "may contain traces of allergens" being the most common advice labeling used. Most food products complied with local regulations. However, about 25.3% of the survey respondents had food allergy themselves or caregivers of a food-allergic sufferer. 15.3% reported history of a severe food allergic reaction. Moreover, suffering from a previous serious food allergic reaction was associated with high knowledge and attitude scores respectively; ( $\beta=-1.394/p <0.001$ ) and ( $\beta=-1.432/p =0.04$ ). Our results provide practical insights on food allergen labeling issues for stakeholders and policymakers in the food supply chain.

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# CHAPTER I

## INTRODUCTION AND LITERATURE REVIEW

### **A. Introduction**

Food allergies are a growing public health concern. They are considered a serious and potentially life-threatening medical condition, which can lead to death (Loh & Tang, 2018). The Centers for Disease Control and Prevention (CDC) reported that food allergies affect 15 million persons, responsible for approximately 30,000 emergency department visits; and cause 150 to 200 deaths every year in the United States (CDC, 2017). To date, there is no cure for food allergy. However, preventing severe health consequences can be accomplished by strict avoidance of food allergens and cautious reading of the labeling present on food. According to different international labeling standards, it is mandatory to list the major food allergens that cause allergies and intolerances on the labeling of pre-packaged and non-packaged foods (FAO & WHO, 2001; Regulation (EC) 1169/2011). For instance, contamination with allergens can happen during food transportation, storage, or processing and accidentally end up in food (Blom, et al., 2018). So, food-allergic consumers have been increasingly seeking information about the use of shared facilities and equipment because they fear hidden allergens. For this purpose, food manufacturers started to use precautionary advisory labeling on packaged food such as "may contain [allergen]" but their absence from the labeling doesn't indicate that the food is safe for consumption by allergic people (Allen, et al., 2014). Thus, constant vigilance upon purchasing pre-

packed foods at the retail level is mandatory and vital. Yet unfortunately, there are still gaps in food allergen labeling knowledge and practices among consumers.

## **B. Food Allergies: Definition, Management, and Treatment**

A food allergy reaction occurs when the immune system overreacts to the proteins in food, known as allergens (NIAID, 2010). The immune response in food allergy can be classified into non-IgE-mediated, IgE-mediated or a mixture of both. IgE-mediated food allergy requires the development of IgE specific anti-body to a food allergen, followed by the development of signs and symptoms upon the exposure to the allergen. In non-IgE mediated food allergy, the IgE antibodies are not involved but it is T-cell mediated. Other types of reactions to food that don't involve the immune system are called food intolerances (such as lactose, gluten, and food additives).

Symptoms of food allergies vary widely from mild skin rashes and gastrointestinal discomfort to potentially life-threatening asthma and anaphylaxis. These symptoms develop within minutes to 1-2 hours following the ingestion of food.

More than 160 foods have been reported to cause reactions in the U.S. However, 90 % of food allergic reactions in the United States are caused by eight major food allergens (U.S. Food and Drug Administration, 2018).

Until today, there is no FDA-approved therapy. The only treatments are some medications that are limited for reactions after accidental ingestion. These include antihistamines, epinephrine, and corticosteroids. However, preventing severe health consequences can be accomplished by strict avoidance of food allergens and reading the labeling present on food (U.S. Food and Drug Administration, 2018).

### **C. Prevalence of Food Allergies:**

Food allergies affect 1-3% of adults and 4-6% of children. However, these estimates vary geographically (WHO, 2006). In Europe, the point prevalence and the overall lifetime estimates of self-reported food allergens have been found to be 5.9% and 17.3%, respectively (Nwaru, et al., 2013). Similar rates of self-reported food allergy and food sensitization ranging from 5-19% have been reported in parts of Africa (Obeng, et al., 2010). However, lower rates ranging from 3.4 to 7.0% were reported in East Asian countries including Japan, South Korea, and Taiwan (Loh et al., 2018). Moreover, a survey done by the World Allergy Organization observed that the prevalence rates in children were the highest in Finland, Canada, and Australia and lowest in Iceland and Thailand (Prescott, et al., 2013).

Data on food allergy prevalence rates in the MENA region are very limited. In a study done in Saudi Arabia, 29% of 1341 surveyed patients with asthma showed clinical sensitivity to food (Aba-Alkhail & El-Gamal, 2000). In the United Arab Emirates, the prevalence of physician-diagnosed food allergies was 8% in children (Al-Hammadi et al., 2009). As for Lebanon, the prevalence of food allergies was estimated to be 3.2% in adults and 4.1% in infants (Irani & Maalouly, 2015).

### **D. International and Lebanese Allergen Labeling Standards**

In order to protect food allergic consumers from accidental exposure to food, countries have developed allergen labeling regulations and guidelines. However, these regulations differ significantly around the world. In well-developed countries, food allergen labeling requirements are based on the prevalence of allergens and scientific

research. Other countries adopt one or several regulations (fully or partially) to follow (ex: U.S. Food and Drug Administration, European Union (EU) regulations, or regulations established by Codex Alimentarius). There are two types of labeling: mandatory labeling that is used when the allergen is added as an ingredient to a product intentionally, and voluntary labeling that is used when the unintentional allergen is present in the product as a result of cross-contamination.

In the United States, the *Food Allergen Labeling and Consumer Protection Act of 2004* (FALCPA) identifies eight foods or food groups as the major food allergens that account for over 90 % of all food allergies in the U.S., and represent the most likely foods that result in severe or life-threatening reactions. These include: eggs, milk, fish (e.g., flounder, bass, cod), crustacean shellfish (e.g. lobster, crab, shrimp), peanuts, tree nuts (e.g., walnuts, almonds, pecans), wheat, and soybeans. FALCPA requires food manufacturers to declare the allergens on the label of food products in one of the two ways. The first option is to state the name of the food source in parenthesis following the common name of the major allergen in the list of ingredients. The second option is to place the word "contains" followed by the name of the food source from which the major food allergen was derived. (Food & Drug Administration of the US [FDA], 2018).

Similar regulations have been enforced in the European Union with wider list of allergens. According to the European Union (EU) Regulation 1169/2011, it is mandatory to list 14 major food allergens that cause allergies and intolerances on the labeling of prepackaged and non-packaged foods. These include sesame seed, mustard, mollusks, lupin, and celery in addition to the 8 major allergens (Regulation (EC) 1169/2011).

In Lebanon, the "General Standard for the Labeling of Prepackaged Food" states that the following allergen list that is similar to the EU list should be declared on the labels. (NL 206, 2017).

### **E. Hidden Allergens and Precaution Allergen Labeling**

Potential contamination of food with allergen residues can happen at various points across the food supply chain as a result of the common food industry practices, such as the use of the same equipment to produce allergenic and non-allergenic food products. Such practices can result in the presence of detectable residues in foods and may pose health risks to people with food allergies (Allen, et al., 2014). Consequently, food manufacturers started to use precautionary advisory labeling on packaged food to alert consumers to any possible risk of allergen exposure from these foods. Various types of advisory labeling are used worldwide such as 'may contain x' and 'manufactured in a shared facility with x' (Taylor & Baumert, 2015). However, such type of labeling is not required in any country but many countries do allow food companies to use them and thoroughly regulate them such as Japan, Switzerland, and South Africa (Allen, et al., 2014).

### **F. Characteristics of Allergen Labeling in Packaged Products**

Several studies have been done to assess the adequacy of these guidelines, and to determine the compliance of packaged products with these regulations. A study was done in Malawi reported that all surveyed products complied with the nation's food

allergen labeling requirement. 54.3% of the surveyed products contained allergen declaration in addition to the one present in the ingredient list and 28% used special emphasis (italic, bold, enlarged font). However, none of the locally manufactured products emphasized food allergens (Mfueni et al., 2018). In Brazil, nonconformities were found in 31.4% of the food labels analyzed and 12.1% did not contain the allergy alert (Maria Luísa Cunha et al., 2020). Other studies were conducted to determine the prevalence of precautionary statements on packaged products. Among them, 39% of the surveyed products in France and 65% of the surveyed products in Australia had precautionary allergen labeling (Battisti et al., 2017; Zurzolo, Mathai, Koplin, & Allen, 2013).

### **G. Consumers Purchasing Intention**

Shopping is a stressful event, particularly for people with food allergies. Consumers tend to trust chain supermarkets since they are considered to have enough resources to check the ingredients of products and are perceived to be highly motivated to protect their reputation (Barnett et al., 2011). Studies showed that consumers used a variety of methods to determine if a food contains an allergen. The product name or brand was considered a method for risk assessment adopted by the consumer and reflected on prior experience with the product. Furthermore, when the above information did not assist them in determining a firm answers in regards to allergens contained, they shifted towards the ingredient lists and allergy advice boxes (Simons et al., 2005; Barnett et al., 2011). However, consumers linked and interpreted the absence of the term products "contains" on the products label as a sign or confirmation that the product is be allergen-free. Also, allergic consumers relied on the manufacturer's



information to determine if a food is safe to eat (Simons et al., 2005). Other consumers for example reported that they would taste a small amount of food and wait to see what happens to determine the safety of the product (Barnett et al., 2013). A U.S.-based research study showed that 99% of allergic consumers and their caretakers read the product labels during shopping, and 94% reread these labels during the preparation of food and cooking to prevent the accidental exposure of any allergenic food ingredients (Simons et al., 2005).

However, a study conducted in Greece and Netherlands revealed that precautionary allergen labeling (such as 'may contain X') was not positively viewed by allergic consumers as it caused restrictions in their diet and gave them a feeling of insecurity about their food choices (Cornelisse-Vermaat et al., 2007). Also, a study done in the UK investigated the attitudes of parents of nut-allergic children regarding precautionary allergen labeling, and reported that 80% of the parents avoid a product labeled 'may contain nuts' or 'not suitable for nut allergy sufferers'. However, only 60% avoid a product labeled as 'may contain traces of nuts'; and this percentage drops to 40% for those who avoid 'does not contain any nuts but made in a factory that produces nuts' (Noimark et al., 2009). However, there is no relationship between the risk of contamination and the type of sentences provided in reality (Hefle, et al., 2007).

## **H. Objectives**

The main objectives of this study are to: (i) assess the characteristics of food allergen labeling present on packaged foods; (ii) verify the compliance of food labels according to the local requirements for mandatory labeling of the main foods that causes allergies; (iii) explore the knowledge, attitudes, and practices (KAPs) of consumers toward allergen labeling; (iv) investigate the sociodemographic determinants of knowledge, attitudes, and practices related to allergen labeling among study participants.

## CHAPTER II

### METHODOLOGY

#### **A. Study Setting and Population:**

Market analysis of packaged food products was conducted among two different supermarket chains in Lebanon. Supermarkets were chosen based on the information available online and the suggestions of local citizens. One multinational and one local supermarket chains featuring a flow of consumers with different socioeconomic statuses were included in the survey.

During the market analysis, the graduate student chose products randomly by as many manufacturers as possible to obtain a wide representation after securing the approval from supermarkets managers. For each product, digital photographs were taken and all images were verified twice to link the match between the label captions and products. The information extracted from the images consisted of the following: product and brand names, country of origin, list of ingredients, special emphasis on known allergens on the list of ingredients, and how such emphasis was done, any advisory statements were captured. Also, if the warnings were in a covert place, removable by sealing, or difficult to visualize were counted and if there is an incorrect spelling and the claim about absence of allergens. Both local and imported packaged food products were verified for their compliance with local regulations for the characteristics of allergen labeling regulations (*General Standard for the Labeling of Prepackaged Food*, NL 206). For products with multiple package sizes, only one size

was included in the analysis to avoid bias. Moreover, duplicate products found across the supermarkets were recorded only once.

After that, a descriptive, cross-sectional study was conducted online among Lebanese citizens or residents of Lebanon that are at least 18 years of age and usually participate to the grocery shopping for their household to examine their purchasing habits, attitudes, and use of food allergen labeling.

The intended sample size was calculated using the World Health Organization (WHO) sample size calculator

([www.who.int/ncds/surveillance/steps/resources/sample\\_size\\_calculator.xls](http://www.who.int/ncds/surveillance/steps/resources/sample_size_calculator.xls)).

The level of confidence measured was set at 1.96 (the recommended value for a 95% confidence level), the margin of error (the expected half-width of the confidence interval) at 0.05, and a design effect of 1.5. Assuming a response rate of 0.8, a representative sample of 720 participants was selected.

## **B. Recruitment:**

The graduate student posted an online invitation (Appendix 1) on social media (whatsapp groups, facebook pages, instagram) where participants were invited to the research. Then, interested participants clicked on the link and had access to the survey (Appendix 3). Before starting the questionnaire, a consent form (Appendix 2) appeared on their screen where they read it and were able to download it. After that, if they agreed to take part in the study, they clicked next and started the survey that was conducted via AUB Limesurvey.

### **C. Data Collection**

Data collection was done through AUB Limesurvey between December 2020 and February 2021 and was completely anonymous (no names or any other personal information were recorded). Participants were informed that their participation was completely voluntary, no loss or penalty will take place in case they refuse to participate. Also, those who refused to participate in this project knew that their refusal to take part in the study will not affect their relationship with AUB. Moreover, participants were also informed that they can stop answering the questions at any point in time and can skip any question they don't want to answer. Furthermore, Participants were assured to ask any questions related to the study or request further clarification before agreeing to participate in the study.

All students' researchers and other members of the research team have CITI certification for human subjects' research according to AUB IRB regulations prior the initiation of the study.

Collected data is saved in the PI's password protected computer where only the principle investigator and the graduate student had access to the data. Also, all collected material will be destroyed 5 years after dissemination of the results, as per the IRB instructions.

### **D. Study Instrument**

The survey was based on previous similar studies (Choi & Choi, 2016; Soogali & Soon, 2018; Marchisotto, et al., 2017) and divided into three sections. The first section included questions related to their socio demographic characteristics such as

age, gender, educational level and the amount of income. The second section was composed of questions related to their purchasing. Furthermore, the last section included questions related to the knowledge, attitude, and use of allergen labeling. The completion of the survey took approximately 5-10 minutes.

#### **E. Data Assessment and Interpretation**

Descriptive statistics was presented as means and standard deviations (SD) for continuous variables or as frequencies and proportions for categorical variables. Knowledge scores were calculated for each participant by adding the number of correct answers (out of 5) and use the mean score to dichotomize the participants as having a higher or lower level of knowledge. For the attitude score, we assigned point values to each response as follows: strongly disagree = 1, disagree = 2, unsure = 3, agree = 4, and strongly agree = 5. Then, we computed each participant's average response to the 5 attitude questions by summing up positive attitudes. Data obtained was statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 24.0. Chi-square and independent t-tests were used to calculate the association between two categorical and continuous variables respectively. Univariate and multivariate linear regressions were applied to determine which factors were associated with the knowledge scores and attitude scores. In the regression models, knowledge and attitude scores were used as the dependent variables whereas sociodemographic factors as independent variables. Characteristics that showed statistical significance in the univariate analysis were included in the multivariate model as independent variables. For all analysis done, a p-value of less than 0.05 was considered statistically significant.

## CHAPTER III

### RESULTS

#### A. Market Analysis:

##### 1. Samples

Overall, 1000 food product labels were analyzed. Of these, 951 products had allergen labeling and/or precautionary allergen labeling. Most of the products without food allergen labeling or precautionary allergen labels were naturally allergen-free products or did not contain allergens in their ingredient lists. Thus, the alerts presented in the other samples were analyzed.

##### 2. Categories

The analyzed foods were divided into 14 categories: bakery, baby food, chilled food, frozen food, jam and spreads, ready meals, beverages, canned food, sauces and dressings, dessert mixes, instant food, salty snacks, chocolate, and biscuits (figure 1).

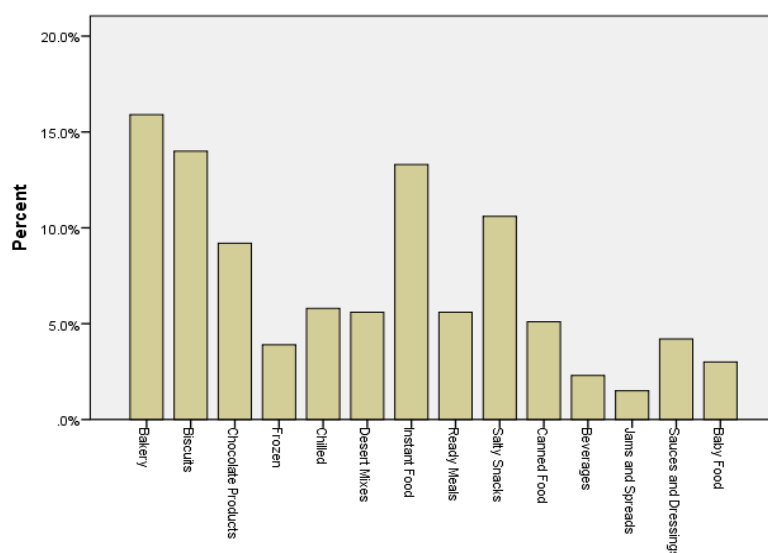


Figure 1-Samples Analyzed and Their Respect Categories

### 3. Allergens Labeling Practices:

#### a. Declaration of Allergens:

For all food categories, the most common frequently declared allergen was wheat (64%) followed by milk (50.9%) and soybean (29.3%). However, the less frequently declared food allergens were sulphites (0.9%), lupin (0.3%), and crustaceans (0.3%) (Table 1).

Table 1- Prevalence of Labeling for Each Category of Allergen

Allergen Category	Presence of Allergen in the Ingredient List N= 908 n (%)	Precautionary Statement N= 408 n (%)
Milk	462 (50.9)	106 (26)
Fish	17 (1.9)	15 (3.7)
Peanut	18 (2)	125 (30.6)
Nut	90 (9.9)	229 (56.1)
Egg	119 (13.1)	135 (33.1)
Celery	22 (2.4)	35 (8.6)
Sesame	48 (5.3)	104 (25.5)
Lupin	3 (0.3)	15 (3.7)
Soya	266 (29.3)	166 (40.7)
Wheat	581 (64)	90 (22.1)
Mustard	29 (3.2)	43 (10.5)
Crustacean	3 (0.3)	18 (4.4)
Sulfite	8 (0.9)	18 (4.4)



b. Special Declaration of Allergens

Most of the imported products carried a special emphasis on the allergens presented on the ingredient list (75.8%). However, for the local products, 51.7% showed special emphasis. Although the styles for special allergen declaration vary significantly (Table 2), a “Contains” statement was noted on most of the locally manufactured products. Contrariwise, putting the font in bold was the most frequently used style of emphasis for imported products.

Table 2- Types of emphasis used when declaring allergens on the ingredient list

Type of Emphasis	N (%)	Local	Imported
Bold	389 (42.7)	36 (11)	353 (60.5)
Contains Statement	230 (25.3)	99 (30.3)	131 (22.5)
Parenthesis	41 (4)	8 (2.4)	28 (4.8)
Allergy Advice	27 (3)	13 (4)	14 (2.4)
Enlargement Font	2 (0.2)	0	2 (0.4)
Underlined	5 (0.5)	2 (0.6)	3 (0.5)
Contrasting Color	1 (0.1)	0	1 (0.2)
No Emphasis (Only present in the ingredient list)	220 (24.2)	169 (51.7)	51 (8.7)

c. Frequency and Characteristics of Precautionary Allergen Labeling

The study showed that of the 951 samples analyzed 42.9% (408 samples) made use of precautionary allergen labeling. Among these samples, 9 different precautionary statements were identified. The most frequently used precautionary statement was "may contain traces of x" (59.6%), followed by "may contain x" (27.7%), and "our facility

handles (4.4%) (Figure 2). Nuts (56.1%) represent the largest group of allergens declared, followed by Soybean (40.7%), and Egg (33.1%) (Table 1).

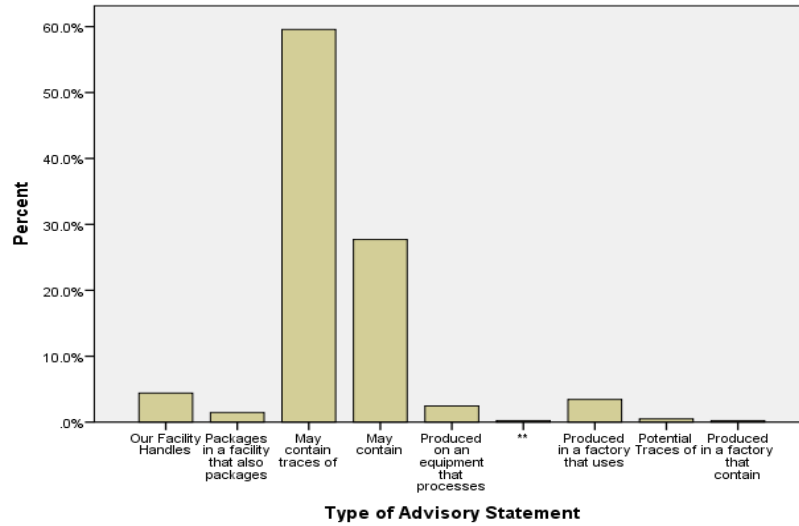


Figure 2-Types of advisory labels used

d. Compliance with local allergen labeling regulation

Most of the products surveyed complied with the allergen labeling requirements of the Lebanese standard institution-LIBNOR (General Standard for Labeling of Prepackaged Foods) (94.1% for locally manufactured and 97.6 % for imported products).

e. Ambiguous declaration

There were 72 ambiguous labeling found in the food products where sources of ingredients were unknown. These can be divided into the type of flour (72.4%), (17.2%) type of spices, type of vegetable oil (5.2%), type of emulsifier used (3.4%), and source of lecithin (1.7%).

Also, a total 27 discrepancies (difference between ingredient list and contains statement) were found. In twelve food products, food allergens were listed in the ingredients but not included in the contain statement. For example, mustard was present in the ingredient list of a product but only declared "contains egg".

In addition, eleven products labeled the allergens in the ingredient list, but also declared them in the precautionary statements. A frozen ready pizza meal declared milk and gluten in the ingredient list but also declared the following "produced in a factory that contains milk and gluten". Moreover, there were two products with two advisory labels, a "may contain" statement and "produced in a factory that also handles". Furthermore, there were two products where the allergen was present in French but was not translated to Arabic and English. However, the type of tree nut was not disclosed for 48.9% 229 of products with advisory labels for tree nuts.

## **B. Survey Analysis**

### ***1. Demographic Characteristics:***

Overall, there were a total of 640 responses. Of these, data were missing for 99 respondents, leaving 541 responses for analysis. Characteristics of the study population are represented in (Table 3). The mean age of participants was  $25.71 \pm 7.65$  years with a higher percentage of females as compared to males (81.8% vs. 18.3%). The mean age is less than that of the general population (31). As for the gender of the general population, almost half of them were males (49.8%) and the other half were females (50.2%). About 81.1% were single while 18.9% were married which is far from the general population (56% and 39%). The majority of the respondents reported that they

had university education (87.6%) which is higher than that of the general population (14.97%). 33.8% respondents are employed in a full time job and 36% are students. The discrepancy in gender, and marital status, and educational level are due to our sample population being recruited from an online survey. Moreover, 36.2% had a monthly income between 1,000,000L.L.and 3,000,000L.L.

Out of the 541 participants, 137 suffer from food allergy or they are a carer of someone who has a food allergy. The top food allergens reported were wheat (18.2%), followed by egg (16.8%), and milk (10.9%). About 15.3% reported history of a severe food allergic reaction.

Table 3-Characteristics of Respondents

Variables	Total N=541	Lebanese General Adult Population N=6,100,075*	Non-Food Allergic N=404 n (%)	Food Allergic N=137 n (%)
Age	25.71 ± 7.65	31**	25.78 ± 7.93	25.50 ± 6.79
Gender				
<i>Male</i>	99 (18.3)	50.2%***	71 (17.6)	28 (20.4)
<i>Female</i>	442 (81.8)	49.8%***	333 (82.4)	109 (79.6)
Marital Status				
<i>Single</i>	439 (81.1)	56%****	320 (79.2)	119 (86.9)
<i>Married</i>	102 (18.9)	39%****	84 (20.8)	18 (13.1)
Governorate				
<i>Beirut</i>	147 (27.2)	9.3%****	111 (27.5)	36 (26.3)
<i>South</i>	169 (31.2)	37.3%****	128 (31.7)	41 (29.9)
<i>North</i>	28 (5.2)	31.2%****	17 (4.2)	11 (8)
<i>Mount Lebanon</i>	165 (30.5)	16.2%****	126 (31.2)	39 (28.5)
<i>Bekaa</i>	32 (5.9)	37.7%****	22 (5.4)	10 (7.3)
Nationality				
<i>Lebanese</i>	467 (86.3)	79.8%****	346 (85.6)	121 (88.3)
<i>Non-Lebanese</i>	74 (13.7)	20.19%****	58 (14.4)	16 (11.7)

<b>Educational Level</b>				
<i>Middle School</i>				
<i>High School</i>	9 (1.7)	25.9%****	6 (1.5)	3 (2.2)
<i>University Degree (Bachelor)</i>	53 (9.8)	12.95%****	41 (10.1)	12 (8.8)
<i>University Degree (Masters/PhD)</i>	285 (52.7)	14.97%****	215 (53.2)	70 (51.1)
<i>Technical School</i>	189 (34.9)	-	138 (34.2)	51 (37.2)
	5 (0.9)	-	4 (1)	1 (7)
<b>Current Employment Status</b>				
<i>Employed Full-Time</i>	183 (33.8)	43.3%****	42 (10.4)	13 (9.5)
<i>Employed Part-Time</i>	55 (10.2)	-	47 (11.6)	22 (16.1)
<i>Seeking Employment</i>	69 (12.8)	-	30 (7.4)	8 (5.8)
<i>Unemployed/Housewife</i>	38 (7)	11.4%****	1 (2)	0
<i>Retired</i>	1 (2)	-	153 (37.9)	42 (30.7)
<i>Student</i>	195 (36)	-		
<b>Total Monthly Income</b>				
<i>Less than 1,000,000L.L.</i>	68 (12.2)	-	52 (12.8)	14 (10.2)
<i>1,000,000-3,000,000L.L.</i>	196 (36.2)	-	147 (36.4)	49 (35.8)
<i>3,000,000-5,000,000L.L.</i>	138 (25.5)	-	103 (25.5)	35 (25.5)
<i>Greater than 5,000,000L.L.</i>	141 (26.1)	-	102 (25.2)	39 (28.5)

\* CIA Factbook, 2019, \*\* Mouhtadi et al., 2018; \*\*\* World Bank, 2016; \*\*\*\* CAS, 2009

## 2. *Purchasing Habits:*

About 35.8 % of food allergic participants and their caregivers reported that they do grocery shopping more than 5 times per month and the majority (73.7%) purchase from larger supermarket stores (Table 4).

The top three label components that food allergic shoppers and their carers look at were allergen information (85.4%), country of origin (77.4%), and brand/company name (70.1%) (Table 5).

Table 4 -Purchasing Practices

Variables	FA N=137 n (%)
<b>Grocery Shopping Per Month</b>	
<i>1</i>	23 (16.8)
<i>2</i>	20 (14.6)
<i>3</i>	25 (19.2)
<i>4</i>	20 (14.6)
<i>&gt;5</i>	49 (35.8)
<b>Shopping Habit</b>	
<i>Online Shopping</i>	2 (1.5)
<i>Grocery-Delivery Service</i>	6 (4.4)
<i>Purchasing from Small Supermarkets</i>	28 (20.4)
<i>Purchasing from Large Supermarkets</i>	101 (73.7)

Table 5 -What do shoppers mostly look at food labels?

Variables	FA N=137 n (%)
<b>Brand Company Name</b>	
<i>Always</i>	96 (70.1)
<i>Sometimes</i>	32 (23.4)
<i>Never</i>	9 (6.6)
<b>Appearance</b>	
<i>Always</i>	58 (42.3)
<i>Sometimes</i>	63 (46)
<i>Never</i>	16 (11.7)
<b>Country of Origin</b>	
<i>Always</i>	106 (77.4)
<i>Sometimes</i>	11 (8)
<i>Never</i>	20 (14.6)
<b>Price</b>	
<i>Always</i>	73 (53.3)
<i>Sometimes</i>	60 (43.8)
<i>Never</i>	4 (2.9)
<b>Expiration Date</b>	
<i>Always</i>	101 (73.7)
<i>Sometimes</i>	31 (22.6)
<i>Never</i>	5 (3.6)
<b>Allergen Information</b>	
<i>Always</i>	117 (85.4)
<i>Sometimes</i>	14 (10.2)
<i>Never</i>	6 (4.4)
<b>Nutrition Facts/Panel</b>	
<i>Always</i>	29 (21.2)
<i>Sometimes</i>	80 (58.4)
<i>Never</i>	28 (20.4)

Storage and Handling Information

<i>Always</i>	
<i>Sometimes</i>	23 (16.8)
<i>Never</i>	68 (49.6)
	46 (33.6)

Food Additives

<i>Always</i>	27 (19.7)
<i>Sometimes</i>	61 (44.5)
<i>Never</i>	27 (19.7)

a. Purchasing Habits for Food Allergic Participants and their Caregivers in Relation to Allergen Labeling:

About 81.6% of the respondents always check the ingredient lists before purchasing a food item. However, the percentage is 54.7% for those who always check advisory statements before purchasing. Concerning the advisory labels, 17.5% always buy products labeled as "may contain allergens". This percentage increased to 41.6% for those who buy products labeled as "may contain traces of allergens". However, 59.1% always buy products labeled as "manufactured in a facility that also processes allergens" (Table 6).

About 58.5% experienced an accidental exposure, 26.3% were linked to failure in reading a food label, and 16.1% were to ignoring a precautionary statement and inappropriate labeling. However, the majority of food allergic respondents and their carers suggested a bigger font, content amount of the allergen, and attractive and colorful symbols in order to separate allergen information from nutrition information to be added to the labels (68.6%).

Table 4-Respondents' purchasing based on food allergen labeling

Variable	n (%)
Check the ingredient list present on label of packaged food before purchasing a food item	
<i>Always</i>	118 (86.1)
<i>Sometimes</i>	6 (4.4)
<i>Purchasing the product for the first time</i>	11 (8)
<i>Never</i>	2 (1.5)
Check the precautionary statements if present on label of packaged food before purchasing a food item	
<i>Always</i>	75 (54.7)
<i>Sometimes</i>	36 (26.3)
<i>Never</i>	26 (19)
Purchase Product with the Following Label	
"May Contain Allergens"	
<i>Always</i>	24 (17.5)
<i>Sometimes</i>	72 (52.6)
<i>Never</i>	41 (29.9)
"May Contain Traces of Allergens"	
<i>Always</i>	57 (41.6)
<i>Sometimes</i>	55 (40.1)
<i>Never</i>	25 (18.2)
"Manufactures in a Facility that also Processes Allergens"	
<i>Always</i>	81 (59.1)
<i>Sometimes</i>	38 (27.7)
<i>Never</i>	18 (13.1)
"Allergen Free"	
<i>Always</i>	47 (34.3)
<i>Sometimes</i>	69 (50.4)
<i>Never</i>	21 (15.3)

### 3. Food Allergen Labeling Knowledge Score:

Food Allergic Participants and their Caregivers: Out of 5 knowledge questions, the mean food allergy knowledge score was  $2.16 \pm 0.98$ , ranging from lowest score = 0 to highest score equal to 5. However, 14.6% of respondents did not know that names of major allergens were required legally to be reported on labels. Also, 77.4% of respondents incorrectly believed that precautionary statements are required by law, and 17.5% reported that they did not know. 42.3% of respondents believed that



precautionary statements/advisory labels were based on the content amount of allergen present (Table 7).

Table 7-Respondents' Knowledge about Food Labeling Laws

Knowledge	n (%)
Food source names of major allergens required by law	
<i>True</i>	64 (46.7)
<i>False</i>	53 (38.7)
<i>I don't Know</i>	20 (14.6)
Advisory label required by law	
<i>True</i>	106 (77.4)
<i>False</i>	7 (5.1)
<i>I don't Know</i>	24 (17.5)
Advisory label are based on amounts	
<i>True</i>	58 (42.3)
<i>False</i>	59 (43.1)
<i>I don't Know</i>	20 (14.6)

a. Linear Regression Results of Food Allergic Participants and their Caregivers Knowledge Scores:

Simple linear regression results indicated that among all socio-demographic characteristics considered in this study, previous experience of a severe food allergic reaction and the governorate where the participants live were the predictors associated with knowledge scores. Living in the North area was significantly associated with lower knowledge score as compared to Beirut area ( $\beta=-1.023$  / $p =0.02$ ). In addition, not having previous severe experience of food allergic reaction was associated with a lower knowledge score ( $\beta=-1.43/p <0.001$ ) (Table 8).

Table 8-Linear Regression for Knowledge Scores

	Simple Linear Regression B Coefficient, (95% CI)	p-value
Gender	0.214 (-0.201, 0.628)	p=0.310
Age	0.02 (-0.004, 0.045)	p=0.107
Marital Status	0.014 (-0.482, 0.511)	p=0.954
Nationality	-0.112 (-0.633, 0.41)	p=0.673
<b>Governorate</b>		
<i>Beirut (Ref)</i>		
<i>South</i>	-0.043 (-0.477, 0.392)	p=0.846
<i>North</i>	-1.023 (-1.678, -0.367)	p=0.002*
<i>Bekaa</i>	0.150 (-0.530, 0.830)	p=0.663
<i>Mount Lebanon</i>	-0.237 (-0.677, 0.202)	p=0.288
<b>Educational Level</b>		
<i>Middle School (Ref)</i>		
<i>High School Diploma</i>	-0.083 (-1.209, 1.043)	p=0.884
<i>Undergraduate (Bachelor's Degree)</i>	-0.105 (-1.133, 0.924)	p=0.841
<i>Master's degree</i>	0.843 (-0.193, 1.88)	p=0.11
<i>Technical School</i>	1.667 (-0.348, 3.681)	p=0.104
<b>Employment Status</b>		
<i>Employed (Full Time) (Ref)</i>		
<i>Employed (Part Time)</i>	0.288 (-0.313, 0.89)	p=0.344
<i>Seeking employment</i>	0.351 (0.142, 0.845)	p=0.161
<i>Unemployed / Housewife</i>	0.317 (0.419, 1.054)	p=0.396
<i>Student</i>	-0.201 (-0.603, 0.202)	p=0.326
<i>Retired</i>	-	-
<b>Total Income</b>		
<i>&lt; 1,000,000 LBP (Ref)</i>	-	-
<i>1,000,000-3,000,000 LBP</i>	0.149 (-0.439, 0.736)	p=0.617
<i>3,000,000-5,000,000 LBP</i>	-0.014 (-0.626, 0.598)	p=0.963
<i>&gt; 5,000,000 LBP</i>	-0.284 (-0.887, 0.319)	p=0.353
Previous Experience of a severe reaction	-1.430 (-1.827, -1.034)	p<0.001*

#### 4. Food Allergen Labeling Attitude Scores:

Almost half of the respondents (53.3%) disagreed or strongly disagreed that precautionary statements are easy to understand and considered helpful. However, the majority (89.1%) agreed or strongly agreed on the usage of generic terms in the

ingredients list (ex: spices, flour). About 70.8 % and 78.1% also agreed or strongly agreed that E-numbers are provided with no details and lack of information (ex: manufacturer's details) (Table 9).

Table 9-Attitudes toward Food Allergen Labeling

Variable	n (%)
Precautionary statements are easy to understand and considered helpful	
<i>Strongly Agree</i>	13 (9.5)
<i>Agree</i>	10 (7.3)
<i>Neutral</i>	41 (29.9)
<i>Disagree</i>	44 (32.1)
<i>Strongly Disagree</i>	29 (21.2)
Generic terms used in the ingredients list (ex: spices)	
<i>Strongly Agree</i>	60 (43.8)
<i>Agree</i>	62 (45.3)
<i>Neutral</i>	12 (8.8)
<i>Disagree</i>	1 (0.7)
<i>Strongly Disagree</i>	2 (1.5)
E-numbers are provided with no details	
<i>Strongly Agree</i>	39 (28.5)
<i>Agree</i>	58 (42.3)
<i>Neutral</i>	38 (27.7)
<i>Disagree</i>	1 (0.7)
<i>Strongly Disagree</i>	1 (0.7)
Lack of information (ex: manufacturer's details)	
<i>Strongly Agree</i>	43 (31.4)
<i>Agree</i>	64 (46.7)
<i>Neutral</i>	23 (16.8)
<i>Disagree</i>	6 (4.4)
<i>Strongly Disagree</i>	1 (0.7)

a. Linear Regression Results of Food Allergic Participants and their Caregivers

Attitude Scores:

Demographic variables were entered into the regression model, with attitudes score as the dependent variable. Few predictors such as employment status and previous experience of severe food allergic reaction were associated with attitude score because

nearly all the respondents scored high attitude points. However, multiple regression analysis showed that only not having previous experience of severe food allergic reaction is associated with lower attitude scores ( $\beta=-1.432/p=0.04$ ) (Table 10).

Table 10-Linear Regression for Attitude Scores

Variable	Simple Linear Regression B Coefficient, (95% CI)	p-value	Multiple Regression B Coefficient, (95% CI)	p-value
Gender	0.036 (-1.185, 1.258)	p=0.953		
Age	0.049 (-0.023, 0.121)	p=0.183		
Marital Status	0.172 (-1.285, 1.63)	p=0.816		
Nationality	-0.255 (-1.788, 1.278)	p=0.743		
<b>Governorate</b>				
<i>Beirut (Ref)</i>				
<i>South</i>	0.057 (-1.261, 1.375)	p=0.932		
<i>North</i>	0.03 (-1.958, 2.018)	p=0.976		
<i>Bekaa</i>	1.367 (-0.696, 3.429)	p=0.192		
<i>Mount Lebanon</i>	-0.359 (-1.693, 0.975)	p=0.595		
<b>Educational Level</b>				
<i>Middle School (Ref)</i>				
<i>High School Diploma</i>	-1.583 (-5.187, 2.021)	p=0.386		
<i>Undergraduate (Bachelor's Degree)</i>	-0.305 (-3.597, 2.987)	p=0.855		
<i>Master's degree</i>	0.725 (-2.592, 4.043)	p=0.666		
<i>Technical School</i>	5.667 (-0.781, 12.114)	p=0.084		
<b>Employment Status</b>				
<i>Employed (Full Time) (Ref)</i>				
<i>Employed (Part</i>	-0.596 (-2.367,	p=0.507	-0.569 (-2.318,	P=0.521

Time)	1.175)		1.181)	
Seeking employment	-0.068 (-1.521, 1.384)	p=0.926	-0.081 (-1.516, 1.354)	P=0.912
Unemployed / Housewife	0.625 (-1.544, 2.794)	p=0.57	0.336 (-1.825, 2.496)	P=0.759
Student	-1.202 (-2.387, -0.017)	p=0.047*	-1.057 (-2.235, 0.122)	P=0.078
Retired	-	-	-	-
Total Income				
< 1,000,000 LBP (Ref)				
1,000,000-3,000,000 LBP	1.628 (-0.118, 3.374)	p=0.067		
3,000,000-5,000,000 LBP	1.029 (-0.789, 2.846)	p=0.265		
> 5,000,000 LBP	-0.284 (-0.549, 3.032)	p=0.172		
Previous Experience of a severe reaction	-1.667 (-3.004, -0.33)	p<0.001*	-1.432 (-2.798, -0.067)	P=0.04*

## CHAPTER IV

### DISCUSSION

Food allergies are a growing public health problem. However, preventing severe health consequences can be accomplished by strict avoidance of food allergens and cautious reading of the labeling present on food (Pieretti et al. 2009). In the present study, the characteristics of the food allergen labeling and advisory labeling of products available in Lebanon were analyzed. In addition, the knowledge, attitudes, and practices of consumers toward these types of labeling were assessed. The results showed that the most common declared allergens were wheat (64%) followed by milk (50.9%) and soybean (29.3%). This is consistent with the study done in Malawi by (Mfueni et al., 2018) who reported that wheat was also the most frequently declared allergen (95%) followed by milk (64%) and soy (55%).

The presence of precautionary advisory labeling on packaged food is used to alert consumers to any possible risk of allergen exposure from these foods. However, these statements are not regulated in most countries. In the present study, 42.9% of the products made use of precautionary statements and the most commonly utilized statement was "may contain traces of x". Similar results were reported in Latin America (33.2%) (Ontiveros et al., 2020). However, a higher percentage was reported in Australia (65%) (Zurzolo et al., 2013). Precautionary allergen labels are usually confusing to food allergic consumers. As a result, many food allergic consumers tend to ignore them (Allen et al., 2014). 17.5% of the participants always buy products labeled as "may contain allergens". This percentage increased to 41.6% for those who buy products

labeled as "may contain traces of allergens". However, 59.1% always buy products labeled as "manufactured in a facility that also processes allergens". Similarly, in the U.S. and Canada; a study displayed that 11% of the respondents purchased food with 'may contain' labeling, whereas 40% purchased food with 'manufactured in a facility that also processes' (Marchisotto et al., 2017). However, there is no relationship between the risk of contamination and the type of sentences provided in reality (Hefle, et al., 2007). This shows that this variety and inconsistency of precautionary statements used by food manufacturers have lead many consumers to ignore or misunderstand the labels, which ultimately put them at risk and makes labeling a source of uncertainty with direct effects on control and trust, and indirect effects on emotional adjustment, coping strategies, social interaction, and quality of life (Roma, et al., 2010; DunnGalvin, et al., 2014).

Although food allergen labeling regulations can differ from one country to another, the percentages of imported (97.6%) and locally manufactured food products (94.1%) that complied with local regulations were similar. This suggests that beyond differences in regulations from a country another, most packaged food products comply with the local standards. However, non-compliance was observed in 3.8% of the products due to the undeclaration of certain allergens. According to LIBNOR standard, the inclusion a list of ingredients is mandatory (NL 206, 2017). This requirement may not be sufficient. For instance, it was reported that the use of special styles helps an allergic consumer to pay attention to allergen information on the label (FSA, 2015). However, in the absence of a special emphasis regulating requirement, it is not surprising that almost half (51.7%) of all the surveyed locally manufactured products did not use any special emphasis when declaring allergens. Moreover, ambiguous

labeling may cause confusion among consumers as well. In a study conducted in the United States, misunderstanding generic terms (ex: flavor or spice) was reported as the main reason for allergic reactions (Joshi et al., 2002). Also, the difference between contains statement or allergy alert and the allergens declared in the ingredients list may be a disadvantage as consumers may rely only on the contain statement and ignore other allergens listed in the ingredients (Ben- Shoshan et al., 2012). This might also explain the reason behind the high rate of accidental exposures (58.5%). Of these, 26.3% were linked to failure in reading a food label, and 16.1% were to ignoring a precautionary statement and inappropriate labeling. These results are similar to the Canadian study that recruited food-allergic individuals or their caregivers that found that 47.8% of respondents who experienced an accidental exposure, 47.0% of the reported cases were attributed to inappropriate labeling, 28.6% were linked to failure in reading a food label, and 8.3% were to ignoring a precautionary statement (Sheth et al., 2010).

In addition, we identified important gaps in knowledge around allergen labeling and precautionary statements. For example, 77.4% of allergic individuals or caregivers of allergic individuals incorrectly believed that these statements were required by law. This finding is supported by previous studies of the same topic where Marchisotto et al., 2017 reported that almost half of the respondents in both the United States and Canada believed that these labels are required by law. Results of the linear regression indicate that a previous serious allergic experience is significantly associated with higher knowledge. As for the attitude scores, not having a previous serious reaction was associated with a lower attitude scores among those with food allergies and their caregivers.



Furthermore, the majority of respondents purchase from larger supermarket stores. Similar finding was established in other studies where consumers tend to trust chain supermarkets since they are considered to have enough resources to check the ingredients of products and are perceived to be highly motivated to protect their reputation (Barnett et al., 2011). In addition, it was reported that the product name or brand was considered a method for risk assessment adopted by the consumer and reflected on prior experience with the product. Our results showed similar findings where the top three label components that consumers look at were allergen information, country of origin, and brand/company name.

With food label being the primary risk communication tool between the manufacturer and consumers, it is of great importance to understand their preferences for these labels and cater to their needs. In general, studies showed that food allergic consumers are not satisfied with current labeling. In several studies, consumers preferred the use of symbols that indicate whether an allergen was present or not in the product along with a clearer and well defined allergy content statement (Marra et al., 2017; Voordouw et al., 2009). Besides that, they recommended improvements in font size, color, and shape of nutrition labels for effective communication with allergic consumers (Choi & Choi, 2016). In our study, food allergic consumers and their caregivers agreed or strongly agreed that E-numbers and manufacturers' details should be provided with more details which is consistent with the study conducted in Mauritius by Soogali & Soon, 2020. Also, they suggested a bigger font, content amount of the allergen, and attractive and colorful symbols in order to separate allergen information from nutrition information to be added to the labels.

Limitations of the study should be noted. First, Lebanon is facing an economic crisis so supermarkets visited were missing a lot of products. Hence, the surveyed products present at the time of data collection were limited. Also, the survey on knowledge of food allergen labeling was conducted online and participants were invited via social media which lead to selection bias. Moreover, all data was self-reported, so participants tend to overestimate their understanding and use of labeling, which is subjected to information bias.

## CHAPTER V

### CONCLUSION AND RECOMMENDATIONS

To the best of our knowledge, this study is the first comprehensive report that assessed the characteristics of allergen labeling and consumers' knowledge, attitudes, and purchasing habits of food products with allergens in Lebanon. The results showed that although the majority of the surveyed food products' labeling declared the presence of food allergens according to the local regulations, allergic people are not very well protected since there are still multiple cases of missing, ambiguous and contradictory statements in the labels. Furthermore, our data also showed that there are gaps in knowledge and many misconceptions around precautionary allergen labeling exist, thus affecting purchasing practices of consumers with food allergy. Consistent and clear labeling should increase consumers' confidence while reducing accidental exposures. Thus, improved labeling in such a way that allergens are easily noticeable is part of the solution. Until such measures are in place, ongoing educational programs should be done to help inform food allergic patients and their caregivers about food allergen labeling and how to purchase products. This conclusion goes along the findings of Dimassi et al., 2020 who assessed the knowledge, attitudes, and practices towards food allergies among diagnosed food allergic individuals in Lebanon. At this time, extensive work should be done to determine the levels of undeclared allergens, and to evaluate the perceptions of food allergen labeling and its practice level among employees in food manufacturing companies.

# APPENDIX I

## INVITATION SCRIPT

### **Invitation to Participate in a Research Study**

This notice is for an AUB-IRB Approved Research Study for Dr. Samer Kharroubi at  
AUB. (Phone: (01) 350 000 Ext: 4541)  
(Email: sk157@aub.edu.lb)

**\*It is not an Official Message from AUB\***

I am inviting you to participate in a research study about **Food Allergen Labeling:  
The Case in Lebanon**

The purpose of the study is to examine the consumers' purchasing habits, attitudes,  
and use of food allergen labeling

You will be asked to complete a short survey/questionnaire of three sections. The  
first section includes questions related to the consumers' socio demographic  
characteristics. The second section is composed of questions related to their  
purchasing. Furthermore, the last section includes questions related to the  
knowledge, attitude, and use of allergen labeling.

You are invited because we are targeting people who are at least 18 years old, who  
participate in shopping for the needs of their home, and are currently residing in  
Lebanon

The estimated time to complete this survey is approximately 5 to 10 minutes

The research is conducted online and is hosted on AUB server

Please read the consent form and consider whether you want to be involved in the  
study

If you have any questions about this study, you may contact the investigator/research  
team (Hanin Chafei, 71430917, hmc13@mail.aub.edu)

## APPENDIX II

### CONSENT FORM

Dear Participant,

You are invited to participate in a research study entitled " Food Allergen Labeling: The Case in Lebanon ".

This study is conducted by Dr. Samer Kharroubi, Department of Nutrition and Food Sciences, American University of Beirut. The main objective of this study is to examine the consumers' purchasing habits, attitudes, and use of food allergen labeling.

This message invites you to read the consent document and consider whether you want to be involved in the study.

And to note that:

- This is not an official message from AUB
- Participation is completely voluntary
- This study will include a sample of 720 participants who are at least 18 years old, who participate in shopping for the needs of their home, and are currently residing in Lebanon
- The recruitment of the participants will be through invitations posted on social media
- Completing the questionnaire will be online and will take around 5-10 minutes
- Only the data you provide in the questionnaire will be collected and analyzed.
- The survey is anonymous and there are no personal or identifying information.
- The research team does not have access to your name or contact details
- Data collected will be monitored and may be audited by the IRB while assuring confidentiality
- You may download the consent form if you wish to keep a copy

#### **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

You will not receive any payment for participation in this study. Also, there will be no direct benefits to you.

However, the results of the study will allow us to provide practical insights in food allergen labeling issues for stakeholders and policy makers in the food supply chain.

## **POTENTIAL RISKS TO SUBJECTS AND/OR SOCIETY**

The risks of the study are minimal and your participation in this survey does not involve any distress.

## **CONFIDENTIALITY**

The collected data will remain confidential and anonymous. It will be stored on the PI's password protected computer, and only the research team would have access to it. Data will be monitored and may be audited by the IRB while assuring confidentiality.

We will be using the information collected from the surveys for our master's thesis project, which is a requirement for our degree at the Department of Nutrition and Food Sciences. Findings from this study will be used for research purposes only.

## **PARTICIPATION AND WITHDRAWAL**

If you voluntarily consent to take part in this study, you can change your mind and withdraw at any time without consequences of any kind. Refusal or withdrawal to participate in the study will involve no penalty or loss of benefits to which you are otherwise entitled. Also, your refusal to take part in the study will not affect your relationship with AUB.

## **QUESTIONS ABOUT THE STUDY**

If you have any questions or concerns about the study, you can contact Dr. Samer Kharroubi at [sk157@aub.edu.lb](mailto:sk157@aub.edu.lb)

## **CONCERNS OR QUESTIONS ABOUT YOUR RIGHTS**

If you have concerns about the study or questions about your rights as a participant, you can contact the American University of Beirut (AUB) Social and Behavioral Institutional Review Board (IRB) at [irb@aub.edu.lb](mailto:irb@aub.edu.lb) or AUB extension: 5445.

## **ACCESS TO THE SURVEY**

If after reading the consent document and having your questions answered, you voluntarily agree to take part in the study, you can access the survey by answering the questions below.

# APPENDIX III

## QUESTIONNAIRE

### **Socio-Demographic Background**

1. What is your age? \_\_\_\_\_
  
2. What is your gender?
  - a. Male
  - b. Female
  
3. What is your marital status?
  - a. Single
  - b. Married
  - c. Divorced
  - d. Widowed
  - e. Separated
  
4. In which governorate of Lebanon do you live?
  - a. Beirut
  - b. South
  - c. North
  - d. Mount Lebanon
  - e. Bekaa
  
5. What is your nationality?
  - a. Lebanese
  - b. Non-Lebanese. Please specify: \_\_\_\_\_
  
6. What is the highest educational level achieved?
  - a. Primary school
  - b. Elementary school
  - c. Middle school
  - d. High school
  - e. University degree (Bachelor)
  - f. University degree (Masters/PhD)
  - g. Technical school
  
7. What is your current employment status?
  - a. Employed full-time
  - b. Employed part-time
  - c. Seeking employment

- d. Unemployed/housewife
- e. Retired
- f. Student

8. What is the total monthly household income (for all your family members, including yourself)?

- a. <1,000,000L.L.
- b. 1,000,000-3,000,000L.L.
- c. 3,000,000-5,000,000L.L.
- d. >5,000,000L.L.

9. Do you have any chronic disease?

- a. Yes, specify \_\_\_\_\_
- b. No

10. Do you suffer from any of the following problems? If yes, please specify

- a. Food Allergy (ex: peanut, milk, gluten...): \_\_\_\_\_
- b. Food Intolerance (ex: gluten, lactose): \_\_\_\_\_
- c. Celiac Disease
- d. I don't suffer from any of the above problems

11. Are you a carer of someone who suffers from any of the following problems? If yes, please specify

- e. Food Allergy (ex: peanut, milk, gluten...): \_\_\_\_\_
- f. Food Intolerance (ex: gluten, lactose): \_\_\_\_\_
- g. Celiac Disease
- h. I'm not a carer of someone who suffer from any of the above problems

12. Do you suffer from any of the following symptoms? (You can select more than one symptom)

- a. Bloating
- b. Indigestion
- c. Eczema or rash
- d. Trouble breathing
- e. Dizziness
- f. Diarrhea
- g. constipation
- h. No, I don't suffer from any of the above symptoms

13. Has anyone in your household ever experienced a severe food allergy reaction, such as anaphylaxis; difficulty breathing; a drop in blood pressure; swelling of the tongue, lips, face or throat; loss of consciousness; or shock?

- a. Yes
- b. No



## Purchasing Behavior

13. How many times do you visit the grocery shop per month?

- a. 1
- b. 2
- c. 3
- d. 4
- e.  $\geq 5$

14. What food shopping habit do you do the most?

- a. Online shopping
- b. Grocery-delivery service
- c. Purchasing from small supermarket stores
- d. Purchasing from large supermarket stores

15. How frequently do you purchase packaged foods during grocery shopping?

- a. Every time
- b. Sometimes
- c. Never

16. How frequently do you use each of the following when you decide to purchase packaged foods? Select the best scale from the 5-point rating scale for each criterion. 1=always and 5= never

Criteria	1 (Always)	2 (Some of the time)	5 (Never)
Brand/company Name			
Appearance			
Country of origin			
Price			
Date of Manufacturing			
Best before date			
Expiration date			
Allergen information			
Nutrition facts panel/label			
Storage and Handling Instructions			
Ingredients list			
Food Additives			

## Food Labeling

17. Do you check the ingredient list present on label of packaged food before purchasing a food item?
  - a. Always
  - b. Sometimes
  - c. Purchasing the product for the first time
  - d. Never
  
18. Do you check the allergy warning statements (for example: may contain x or manufactured on equipment which also processes x [x=gluten, milk, soy, peanut, almond ...]) if present on the label?
  - a. Always
  - b. Sometimes
  - c. Never
  
19. Someone with a food allergy can die from eating the food they are allergic to.
  - a. True
  - b. False
  - c. I don't know
  
20. Food allergic individuals can consume the food allergen provided in small amount
  - a. True
  - b. False
  - c. I don't know
  
21. Precautionary advisory labels (for example: may contain x or manufactured on equipment which also processes x [x=gluten, milk...]) are not based on the amount of allergen present in food.
  - a. True
  - b. False
  - c. I don't know
  
22. Current law requires that food labels identify the food source names of all major food allergens used to make the food.
  - a. True
  - b. False
  - c. I don't know
  
23. Are precautionary advisory labels (for example: may contain x or manufactured on equipment which also processes x [x=gluten, milk...]) required by law?
  - a. Yes
  - b. No
  - c. I don't know

24. At times, it can be problematic to identify suitable foods for individuals suffering from food allergies and intolerance. To what extent do you agree or disagree with the following statements: (1: Strongly disagree to 5: Strongly agree)

<b>Criteria</b>	<b>1 (Strongly disagree)</b>	<b>2 (Disagree)</b>	<b>3 (Neutral)</b>	<b>4 (Agree)</b>	<b>5 (Strongly Agree)</b>
Precautionary allergen labeling such as "may contain X" are easy to understand and considered helpful					
Generic terms are used in the ingredients list (e.g. flavours, spices, vegetable oil)					
E-numbers present should be provided with more details					
Information (e.g. manufacturer's details) should be present on the product					
Recall Policies should be established					

25. How often do you purchase products labeled by the following statements?

<b>Statements</b>	<b>Never</b>	<b>Sometimes</b>	<b>Always</b>
'Contains Soya and Fish Products' if you are allergic to fish			
May Contain [X: gluten, tree nuts, milk...]			
May Contain Traces of [X: gluten, tree nuts, milk...]			
Manufactured in a facility that processes [X: gluten, tree nuts, milk...]			

Manufactured on the same equipment as products containing [X: gluten, tree nuts, milk...]			
Not suitable for people with a [X: gluten, tree nuts, milk...]			
[X: gluten, tree nuts, milk...] Free			

**PLEASE COMPLETE THE REMAINING QUESTIONS ONLY IF YOU SUFFER OR YOU ARE A CARER OF SOMEONE WHO HAVE A FOOD ALLERGY/INTOLERANCE**

26. Have you experienced an accidental exposure to the allergen due to any of the following?

- a. Inappropriate labeling
- b. Failure to read a label
- c. Ignoring precautionary statements such as may contain x
- d. Other
- e. I didn't experience any accidental reaction

27. Suggested Changes on the label (you can select more than one answer)

- a. Bigger font
- b. Attractive and colorful symbols in order to separate allergen information from nutrition information
- c. Content amount of allergen
- d. All of the above
- e. None of the above, I'm satisfied with the current labeling

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