

AMERICAN UNIVERSITY OF BEIRUT

KNOWLEDGE, ATTITUDES, AND PRACTICES TOWARDS  
POULTRY HANDLING AND *SALMONELLA* RISK AMONG  
HOUSEHOLDS IN BEIRUT, LEBANON

by  
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A thesis  
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for the degree of Master of Science  
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at the American University of Beirut

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# ABSTRACT OF THE THESIS OF

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for

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Title: Knowledge, Attitudes, and Practices Towards Poultry Handling and Salmonella Risk Among Households in Beirut, Lebanon

Food poisoning or food-borne disease (FBD) is defined as an illness that results from consuming foods contaminated with bacteria, their toxins, viruses, or parasites. Food poisoning due to improper food handling is a major public health problem globally. FBD's are a leading cause of morbidity and mortality worldwide. In Lebanon, there exists a plethora of challenges which affect the consumption of safe food. Poultry has been identified as a common food vehicle for many pathogens, such as *Salmonella* spp. This bacterium can contribute to serious range of illnesses such as gastroenteritis which includes abdominal pain, vomiting, diarrhea, and fever. FBD's may be prevented and reduced with increased consumer food safety practices and knowledge.

This study aimed to examine the knowledge, attitudes, and practices (KAPs) towards poultry handling among households in Beirut, Lebanon, and to identify factors that affect KAP levels. Unfortunately, there still exists numerous misconceptions on handling chicken, therefore, this study intended to address this research gap. A cross-sectional study was conducted through face-to-face interviews among 125 households in different areas of Beirut. The interview was divided into four main parts: sociodemographic characteristics, knowledge, attitudes, and practices. The results showed that the consumers knowledge and practices were inadequate, however, their attitude was positive. Those between 43-55 years old had higher odds of having good level of knowledge compared to those between 18-29 years old (OR = 3.889, p = 0.02). Nonetheless, those with a college education were 7.442 times more likely to have a positive attitude towards food safety compared to those with no previous formal education (p=0.005). The majority of the participants (91.2%) do not check their refrigerator and freezer temperatures regularly. Furthermore, there were significant associations (p=0.000) between the different KAP levels. This study was intended to raise public awareness regarding handling chicken directed towards minimizing food-borne illnesses through evaluating food handlers' knowledge and behaviors.

*Keywords:* food poisoning; food-borne diseases; food safety; *Salmonella*; poultry; pathogens; knowledge; attitudes; practices; Lebanon.

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# CHAPTER I

## INTRODUCTION AND LITERATURE REVIEW

### A. Introduction

Foodborne illness (FBI) is a growing public health concern worldwide. FBI is defined as any illness that results from the consumption of contaminated food or drinks from pathogenic bacteria, parasites, and viruses (Bintsis, 2017). Although nowadays individuals are becoming more aware of the safety of their food, the World Health Organization (WHO) calculated that 33 million years of lives are lost globally; which are attributed to consuming unsafe food (WHO, 2022). Foodborne illnesses are a leading cause of morbidity and mortality globally. It is estimated by the Center for Disease Prevention and Control (CDC) that 76 million diseases, 325,000 hospital admissions, and 5,000 deaths per year are caused by FBI (CDC, 2001).

Salmonellosis; an infection with *Salmonella species* (spp), is associated with the highest number of incidences worldwide, causing about 100,000 illnesses in the European Union (EU) in 2018; (Ehuwa et al., 2021) accounting for more than half of the cases in the EU. It is due to the consumption of food contaminated with *Salmonella* which could be present in raw or undercooked poultry, meat, eggs, unpasteurized milk, and infant formulas (Ehuwa et al., 2021). Symptoms comprise of abdominal pain, diarrhea, fever, headache, nausea, and vomiting. *Salmonella* is a major biological hazard as it is prevalent in many food products and may spread from poor personal hygiene practices, cross-contamination, improper storage, and inadequate heating and cooling of food.

*Salmonella* is a type of gram-negative, rod-shaped bacterium. It has a flagellum for movement, and it is considered a facultative anaerobe; meaning it can survive in the presence or absence of oxygen (Kurtz et al., 2017). *Salmonella* inhabits the

gastrointestinal tract of humans and animals and causes digestive disturbances, which is due to Nontyphoidal *Salmonella* (NTS), or in other cases, may cause typhoid fever, which is attributed to *Salmonella Typhi*. This bacterium grows within a wide temperature range from 5 - 46°C, with an optimum of 37°C (Kurtz et al., 2017). As for the pH, it is broad as *Salmonella* can grow between 3.8 and 9, and is capable of surviving at low moisture levels with an optimum water activity of 0.99 (Kurtz et al., 2017).

## **B. Literature Review**

Several studies highlight the risks of *Salmonella* infections related to poultry, however, there are limited studies that show the association between the knowledge, attitudes, and practices of individuals at the household level.

According to the South African Poultry Association (SAPA) 98% of meat consumed in 2016 was actually chicken meat as it is considered the consumers' main source of protein (Katiyo et al., 2017).

A cross-sectional study was done in South Africa, whereby 863 participants filled out a survey regarding their knowledge about handling raw poultry. The results indicated that 93% were unaware of the adequate temperature of refrigeration for chicken and 55% did not properly handle raw poultry at purchasing (Katiyo et al., 2017). This shows a need for adequate consumer education.

Another study done in Italy highlighted that consumers' knowledge is relatively low: only 39.9% of individuals knew the effects and role of *Salmonella* and 62.7% reported that they defrost meats and fish at room temperature and 78.7% declared that for both raw and cooked foods, the same cutting board was used (Langiano et al., 2011). Consumer's lack of knowledge regarding proper food safety practices in the kitchen is

correlated with their socio-demographic factors such as education level, age, marital status, profession, and gender.

In addition, a study conducted in Nigeria explored the knowledge, attitude, and practices of food safety among street food vendors. The study found that 90.6% of the vendors had poor knowledge of food safety, and only 5.5% had good knowledge. Additionally, the study found that 84.4% of the vendors did not have any formal training on food safety practices (Yusuf et al, 2020). This highlights the importance of providing food safety training to street food vendors. Street food vending is a popular and important source of food for many people in Nigeria. The findings of this study are consistent with other studies conducted in developing countries, which have shown that street food vendors often lack knowledge and training in food safety practices. It is important for governments and other stakeholders to prioritize the implementation of food safety regulations and training programs for street food vendors to ensure the safety of the food they serve to the public. This can lead to healthier communities and a reduction in the incidence of foodborne illnesses.

Moving on, in a study conducted in Malaysia, it was found that most consumers had poor knowledge of food safety practices, particularly in relation to cross-contamination and proper storage of food (Haque et al., 2018). The study also found that consumers who had higher levels of education and income had better knowledge of food safety practices. In fact, this study aimed to assess the knowledge of consumers regarding food safety practices. Cross-contamination occurs when harmful microorganisms are transferred from one food item to another, which can result in foodborne illnesses. Proper storage of food is also important in preventing the growth of harmful bacteria that can cause foodborne illnesses. The study also found that consumers who had higher levels of

education and income had better knowledge of food safety practices. This suggests that education and socioeconomic status are important factors that influence knowledge and understanding of food safety practices. This finding is consistent with other studies conducted in different parts of the world that have shown that education and socioeconomic status are associated with better food safety practices. The findings of this study are important because consumers play a critical role in ensuring the safety of the food they consume. By having adequate knowledge of food safety practices, consumers can take the necessary steps to prevent the spread of foodborne illnesses. The results of this study suggest that there is a need for increased awareness and education on food safety practices among the general population in Malaysia, particularly among those with lower levels of education and income. Overall, this study highlights the importance of food safety education for consumers, regardless of their socioeconomic status. It is crucial that consumers are aware of proper food handling and storage practices to prevent the spread of foodborne illnesses and protect public health.

Finally, a study conducted in Australia found that young adults aged 18-25 had poor food safety knowledge, particularly in relation to the safe storage and handling of leftovers (Anthony et al., 2013). The study suggests that there is a need for food safety education targeted specifically at young adults aged 18-25 to improve their knowledge and understanding of safe food handling practices. This education can be provided through a variety of channels, such as social media campaigns, food safety classes, and outreach programs. Improving food safety knowledge among young adults is important, as they often have different food habits and behaviors compared to other age groups. Many young adults eat out frequently, rely on convenience foods, and may not have had much experience with cooking and food preparation. These factors can increase the risk

of foodborne illness if proper food safety practices are not followed. So, the study conducted in Australia emphasizes the importance of providing targeted food safety education and awareness campaigns for young adults aged 18-25. By improving their knowledge and understanding of safe food handling practices, young adults can take steps to prevent the spread of foodborne illnesses and protect their health.

On the other hand, in the Arab region, a cross-sectional study was conducted in Jordan with 117 chicken shawarma food handlers to evaluate their food safety related handling practices from receiving the chicken until selling it. The majority of participants (83%) agreed it was important to separate raw chicken from vegetables, but only 43% knew that chicken and meat should be on the lower fridge shelves while vegetables should be placed on top (Nasraween et al., 2018). Moreover, it was alarming that only 56% of food handlers knew the safest method for thawing chicken and 4.2% knew how long microorganisms need to multiply in food (Nasraween et al., 2018). These results indicate that these food handlers have poor to fair knowledge regarding chicken handling. However, those with previous trainings or qualifications scored higher compared to those without any previous trainings done.

Next, a study conducted in the United Arab Emirates (UAE) aimed to assess the food safety knowledge and practices of food handlers in local restaurants. The study found that while the majority of food handlers (81%) were aware of the importance of hand hygiene, only 33% practiced proper hand hygiene techniques (Al-Shabib et al., 2017). Additionally, the study found that food handlers had limited knowledge of food safety practices, with only 29% of participants able to correctly identify the temperature range for storing hot food and 31% able to identify the temperature range for storing cold food. These results highlight the need for improved food safety training and education for

food handlers in the UAE. The lack of knowledge regarding temperature control for storing hot and cold food also indicates a need for improved education and training on basic food safety principles. Without adequate knowledge and understanding of these principles, food handlers may inadvertently put the health of their customers at risk by serving food that is not stored at the correct temperature. Overall, the study highlights the need for ongoing training and education for food handlers in the UAE to ensure that they have the knowledge and skills necessary to maintain high standards of food safety in local restaurants. Improving food safety practices among food handlers can help prevent foodborne illnesses and protect public health.

Furthermore, another study conducted in Egypt aimed to evaluate the food safety practices of street food vendors in Cairo. The study found that most street food vendors (86%) had poor knowledge of food safety practices, and only 14% had good knowledge (Gomaa et al., 2018). The study also found that 78% of street food vendors did not use gloves while handling food, and 90% did not use hairnets or hats (Gomaa et al., 2018). These findings indicate that street food vendors in Cairo have poor food safety practices, which can increase the risk of foodborne illness for consumers. The study also highlighted some of the factors associated with poor food safety practices among street food vendors in Cairo. For example, the study found that food handlers who had a lower level of education and had been working in the street food industry for longer periods of time were more likely to have poor food safety knowledge and practices (Gomaa et al., 2018). Moreover, street food vendors who perceived their food to be of good quality were less likely to follow food safety practices, which suggests a need for increased awareness about the link between food safety practices and food quality (Gomaa et al., 2018). Overall, the study highlights the importance of addressing food safety issues in the street

food sector in Egypt, including through education and training programs targeted at street food vendors.

Lastly, food safety is an essential aspect of public health, and school canteens play a crucial role in ensuring the safety of students who consume food on school premises. A study conducted in the United Arab Emirates aimed to evaluate the food safety knowledge and practices of food handlers in school canteens (Abushelaibi et al, 2016). The study found that most food handlers (78.8%) had poor knowledge of food safety practices, with only 8.8% having good knowledge. The food handlers had limited knowledge about the proper use of gloves, hairnets or hats, and handling of utensils. Additionally, only 50.3% of food handlers used gloves while handling food, and only 43.2% used hairnets or hats. The findings of this study are alarming and suggest that food handlers in school canteens in the UAE have poor food safety knowledge and practices. These issues can lead to the risk of foodborne illness among school children. Therefore, it is crucial to provide proper training and education to food handlers in school canteens to ensure the safety of the food served to students. The study recommends that educational programs on food safety practices should be implemented for food handlers in school canteens. These programs should focus on proper hygiene practices, proper food handling and storage, and the use of protective equipment. Moreover, it is recommended that regular assessments and monitoring of food safety practices in school canteens should be done to ensure that food handlers comply with the recommended safety measures.

All in all, these studies conducted in different Arab countries highlight the need for improved food safety knowledge and practices among food handlers. The findings suggest that food handlers have limited knowledge of food safety practices, which can increase the risk of foodborne illness for consumers. Improved food safety training and

education, targeted at specific groups of food handlers, can help to improve food safety practices, and reduce the risk of foodborne illness.

With regards to Lebanon, there are various challenges which pose food safety related issues towards consumers. Firstly, the electricity shortage does not allow proper storage of food such as chicken, which increases the risk for food poisoning and foodborne outbreaks. Secondly, in many food chains today there is still a lack of awareness regarding food safety protocols. Other factors also include limited funding for research to be conducted as well as the cost of high quality food products. However, to date, research is scarce in Lebanon with regards to poultry handling and food safety of consumers.

A study was done that compared the knowledge and awareness of 207 dietitians in Lebanon, USA, and the UK. The results suggested that only 46% of participants were aware of appropriate reheating steps but there was a much lower awareness in Lebanon (28%) (Evans et al., 2021). Most of the students were knowledgeable about the “use by” date as an indicator of safety, whereas only 30% in Lebanon knew what it stands for (Evans et al., 2021). Furthermore, cross-contamination from washing chicken was less familiar for the participants from Lebanon. It is important that individuals that will deliver food safety information such as dietitians to be knowledgeable about the topic, and accordingly, rigorous training and food safety education is required for these individuals.

Furthermore, a study conducted in Lebanon aimed to assess the food safety knowledge and practices of poultry handling among street food vendors in Beirut. The study found that only 28% of the street food vendors had good knowledge of food safety practices, while 72% had poor knowledge (Loukieh et al, 2018). Additionally, the study found that a majority of the vendors did not use gloves while handling food (67%), and a large proportion did not use hairnets or hats (88%) (Loukieh et al, 2018). Furthermore,

the study revealed that a high percentage of the vendors did not wash their hands before handling food (86%) and after handling money (70%) (Loukieh et al, 2018). It is important to note that the poor food safety practices among street food vendors can have significant public health implications. Street food is a popular and affordable option for many consumers in the region, but if the food is not prepared and handled properly, it can lead to foodborne illness outbreaks.

Another study conducted in Lebanon aimed to assess the knowledge and practices of food safety among restaurant workers in Tripoli (Halabi et al, 2022). The results indicated that only 25% of the workers had good knowledge of food safety practices, while the majority of the workers (75%) had poor knowledge. The low level of knowledge of food safety practices among restaurant workers is a significant concern. Moreover, the study found that a significant number of workers (73%) did not use gloves while handling food, which can increase the risk of contamination. Similarly, 85% of the workers did not use hairnets or hats while preparing food, which can lead to the contamination of food with hair and other contaminants. Additionally, the study found that only 43% of the workers washed their hands before handling food, and 23% did not wash their hands at all, which can further increase the risk of contamination. These findings suggest that there is a need for improved food safety training and education for restaurant workers in Tripoli, Lebanon. The implementation of food safety regulations and guidelines, as well as regular monitoring and inspections of food establishments, may also be necessary to ensure the safety of food served in restaurants. By improving the knowledge and practices of food safety among restaurant workers, the risk of foodborne illness can be significantly reduced, thereby promoting the health and well-being of consumers.

Overall, the studies conducted in Lebanon suggest that there is a significant lack of awareness and poor knowledge of food safety practices among food handlers, which can increase the risk of foodborne illness for consumers. It is important for the government and private sector to invest in education and training programs to improve food safety practices in Lebanon.

### **C. Objectives**

In Lebanon, some studies were done on food handlers' practices with respect to food chains/hospitals/street vendors, however, information about consumers' level of knowledge about handling chicken and the risk of *Salmonella* are insufficient. Research on this relationship is scarce and no recent studies have been demonstrated in Beirut, Lebanon. Moreover, there exists numerous misconceptions on methods of handling chicken in Lebanon and foodborne diseases are still on the rise. Thus, this present study is intended to acknowledge this research gap. This study aims to (1) assess the knowledge, attitudes, and practices towards poultry handling among households in Beirut, Lebanon, (2) explore the association between the socio-demographic characteristics and the KAP levels among residents in Beirut, and (3) examine the foodborne risk factors and spread awareness on this topic.

## CHAPTER II

### METHODOLOGY

#### **A. Study Population and Data collection**

A cross-sectional study was conducted face-to-face among households with participants whom are between 18-64 years of age in Beirut, Lebanon. Areas that were covered included Hamra, Dahye, Ashrafieh, Bourj Hammoud, Tarik el Jdideh, and Ouzai. Based on a similar study conducted by Halabi et al., the required sample size was determined to be 125 participants in order to investigate the knowledge, attitudes, and practices with respect to poultry handling, with a 95% confidence interval and an error margin not greater than  $\pm 9\%$ . Participants were provided with a consent form to participate in the interview, which was voluntary. Upon visiting the participants, a consent form (Appendix 2) was handed to them to read before starting to fill out the questionnaire. Once they agreed to join the study, they proceeded in answering the survey (Appendix 3). The individuals' participation was voluntary and the answers were kept anonymous. Furthermore, the participants were told to ask if they needed clarification before agreeing to participate. Moreover, the study was ethically approved by the Institutional Review Board (IRB) at the American University of Beirut (AUB).

#### **B. Questionnaire**

The standardized questionnaire was administered face-to-face in order to obtain a higher response rate and more engagement from participants. The survey consists of four main categories. The first category was the socio-demographic characteristics of participants (their area of residence, age, gender, nationality, education, and so on). The

second category tested their knowledge regarding poultry handling and *Salmonella* risks. The third section was related to consumers' attitudes towards food safety, and the final section contains questions on the food safety practices in the kitchen. The questionnaire was created based on previous studies on similar topics (Rabeya et al., 2022). The interview was done orally and took no more than 5-10 minutes to complete. Finally, the questionnaire was pilot-tested on 20 consumers to check for clarity and cultural sensitivity. Data collected during the pilot testing phase were not included in this study. After the interview is done, an educational brochure was handed to participants to spread awareness on the issue (Appendix 4).

### **C. Statistical Analysis**

For the statistical analysis, the responses were collected face-to-face, ensuring complete responses for the data analysis. The data derived was then examined using the Statistical Package for the Social Sciences (SPSS) version 26.0. Each multiple-choice question had 1 correct answer, which accounts to a score of 1 point, however, incorrect answers would receive a score of 0 points. The total KAP score was calculated for each participant by adding all of the correct answers together. Total score was dichotomized as having either high or low food safety KAP. For each variable, 80% of the total number of questions was considered the cut-point (Rabeya et al., 2022), which was following Bloom's cut-off point of 80%. Participants with KAP scores  $\geq 80\%$  were considered to have high KAP levels, and participants having a score below 80% were considered to have low KAP levels. Descriptive statistics was implemented as frequencies and proportions for the categorical variables. Moreover, the chi-square test was used to determine the association between two categorical variables. Simple and

multiple logistic regressions were used to establish which factors were associated with the KAP levels. The sociodemographic characteristics represented the independent variables, while the total knowledge, attitude and practice score ratings represented the dependent variables. The variables that had statistical significance (OR 95% CI) in the simple analysis were included in the multiple logistic regression as independent variables. A p-value of  $<0.05$  was considered statistically significant.

## CHAPTER III

### RESULTS

#### **A. Demographic characteristics of respondents**

A total of 125 individuals residing in Beirut participated in this study. According to Table 1, the majority of participants (19.2%) were located in Hamra area, while the minority were residing in Ashrafieh (14.4%). Furthermore, more than half of the participants were female (61.6%), and 38.4% were male. As for nationality, the majority were Lebanese (84.0%), while 8% were Syrian, 4.8% were Palestinian, 1.6% were French, and 1.6% were American. The majority of the participants were adults aged between 43 and 55 years old (36.8%), while the minority were in the 18-29 age group (12.0%). As for the education, more than half of the participants had a university degree or higher (59.2%), while only 7.2% did not have a previous formal education. Moreover, for the health status question, 69.6% mentioned that they were healthy without any medical conditions, while 7.2% were pregnant, 5.6% were immunocompromised, and 17.6% had other medical conditions. The majority of participants (53.6%) work, and out of those who work, 16.8% had a job in the healthcare field. As for their food safety knowledge, 32.0% reported having a good knowledge of food safety, while 53.6% and 14.4% reported satisfactory and poor food safety knowledge ratings respectively. Additionally, regarding the source of food safety information, 42.4% mentioned social media as their main source of information, while 29.6% answered friends or family members, and only 28.0% get their information from scientific journals. Almost half of the participants (53.6%) reported that the electricity in their house cuts off 6+ hours. As for meal preparation at home, 30.4% reported

cooking meals at home at least five times per week, while only 20.0% prepare meals at home one or two times a week. On the other hand, over half of the consumers (68.0%) purchase their raw chicken from known brands, 18.4% from less popular brands, and 13.6% reported that the source of chicken does not matter. Furthermore, more than half of the participants (60.8%) get their chicken from the supermarket, 36.8% from the brand store directly, and 2.4% order chicken online.

Table 1 Demographic characteristics of participants

<b>Socio-Demographic characteristics and overview of participants</b>		<b>n (%)</b>
Location	Hamra	24 (19.2)
	Dahye	19 (15.2)
	Ashrafieh	18 (14.4)
	Bourj Hammoud	22 (17.6)
	Tarik el Jdideh	20 (16.0)
	Ouzai	22 (17.6)
Gender	Male	48 (38.4)
	Female	77 (61.6)
Nationality	Lebanese	105 (84.0)
	Syrian	10 (8.0)
	Palestinian	6 (4.8)
	French	2 (1.6)
	American	2 (1.6)
Age	18-29	15 (12.0)
	30-42	45 (36.0)
	43-55	46 (36.8)
	56-64	19 (15.2)
Education	No formal education	9 (7.2)
	High school	42 (33.6)
	University degree or higher	74 (59.2)
Health status	Pregnant	9 (7.2)
	Immunocompromised	7 (5.6)
	Healthy	87 (69.6)
	Other	22 (17.6)
Do you work?	Yes	67 (53.6)
	No	58 (46.4)
Is your work in the healthcare field?	Yes	21 (16.8)
	No	104 (83.2)

Food safety knowledge rating	Good	40 (32.0)
	Satisfactory	67 (53.6)
	Poor	18 (14.4)
Source of food safety information	Social media	53 (42.4)
	Friends/family members	37 (29.6)
	Scientific journals	35 (28.0)
How many hours does the electricity go off?	1-3 hours	13 (10.4)
	4-6 hours	45 (36.0)
	6+ hours	67 (53.6)
How often do you prepare meals at home?	At least five times per week	38 (30.4)
	Three to five times per week	62 (49.6)
	One or two times per week	25 (20.0)
Where do you get your raw chicken from?	Known brands	85 (68.0)
	Less popular brands	23 (18.4)
	It doesn't matter	17 (13.6)
You purchase your chicken from:	The supermarket	76 (60.8)
	The brand store directly	46 (36.8)
	Online	3 (2.4)

## B. Food safety knowledge

Table 2 below analyzes the consumer's food safety knowledge. Results showed that the mean score was  $4.53 \pm 2.165$ , which was below the cut-point of 6.4 ( $\leq 80\%$  accuracy), which means that the knowledge of the participants was inadequate. The majority of the participants (69.6%) did not know the right refrigerator temperature when storing chicken. The majority of participants (76.0%) knew the main source of *Salmonella* in food. Most of the respondents (96.0%) knew that hand washing before preparing chicken may reduce risks of food poisoning. 27.2% of the participants didn't know the correct answer to how *Salmonella* is transmitted. 76.0% of participants knew that saliva through sneezing is a form of contamination, while only 24.0% answered incorrectly. On the other hand, 80.0% of respondents didn't know how long chicken can last in a full freezer during a power outage.

Table 2 Summary of consumers' food safety knowledge

	<b>Question</b>	<b>Right answer n (%)</b>	<b>Wrong answer n (%)</b>
1.	Food poisoning can be life-threatening	125 (100)	0 (0)
2.	What's the main source of <i>Salmonella</i> ?	95 (76.0)	30 (24.0)
3.	The refrigerator temperature when storing chicken must be:	38 (30.4)	87 (69.6)
4.	Hand washing before preparing chicken may reduce risks of food poisoning	120 (96.0)	5 (4.0)
5.	<i>Salmonella</i> may be transmitted by:	91 (72.8)	34 (27.2)
6.	Saliva through sneezing is a way of contamination	95 (76.0)	30 (24.0)
7.	If there was a power outage, how long can chicken last in a full freezer?	25 (20.0)	100 (80.0)
8.	How long can you store raw chicken in the refrigerator?	70 (56.0)	55 (44.0)
Total mean of correct answers: $4.53 \pm 2.165$			

### **C. Food safety attitude**

Table 3 below addresses consumers' attitudes towards food safety. The total attitude of the participants was  $3.34 \pm 1.56$  which is above the cut-point of 3.2, which shows a positive attitude overall. The majority of the participants (52.0%) agreed that raw, cooked, and leftover food should not be stored in the same part in the refrigerator. 88.8% of respondents had a positive attitude regarding performing food processing

activities with injured hands. Moreover, 64.0% believed that using different cutting boards and knives for raw vs. ready-to-eat foods may reduce cross-contamination. However, 70.4% said chicken can be consumed pink from inside, while only 29.6% believed that it cannot be consumed this way.

Table 3 Summary of consumers' food safety attitude

	<b>Question</b>	<b>Positive attitude n (%)</b>	<b>Negative attitude n (%)</b>
1.	Do you believe that raw, cooked, and leftover food can be stored in the same part in the refrigerator?	65 (52.0)	60 (48.0)
2.	Do you think that you should not perform food processing activities with injured hands?	111 (88.8)	14 (11.2)
3.	Do you believe that using different cutting boards and knives for raw vs. ready-to-eat foods may reduce cross-contamination?	80 (64.0)	45 (36.0)
4.	Do you think that chicken can be consumed medium rare (still pink from inside)?	37 (29.6)	88 (70.4)
Total mean of correct answers: $3.34 \pm 1.56$			

#### **D. Food safety practices**

Table 4 below summarizes the food safety practices of the consumers. The total mean score according to the table was  $4.51 \pm 2.923$ , which was below the cut-point of

4.8, which indicates bad practices. Positive practices were mostly related to the method of disinfecting surfaces after handling raw poultry as 85.6% had good practices, and 68.8% mentioned that they purchase the chicken last at the supermarket. Bad practices were shown with regards to defrosting chicken (58.4% had bad practices) and method of assuring the chicken is clean before cooking (75.2% had bad practices). Moreover, the majority of the participants (91.2%) do not check their refrigerator and freezer temperatures regularly. Finally, during a power outage, 80.0% of participants had bad practices in dealing with the chicken in their kitchen freezers.

Table 4 Summary of consumers' food safety practices

	<b>Question</b>	<b>Good practice n (%)</b>	<b>Bad practice n (%)</b>
1.	How do you defrost your chicken?	52 (41.6)	73 (58.4)
2.	Do you disinfect surfaces after handling raw poultry?	107 (85.6)	18 (14.4)
3.	How do you assure the chicken is clean before cooking?	31 (24.8)	94 (75.2)
4.	Do you regularly check the temperature of your freezers/fridges to reduce the risk of food poisoning?	11 (8.8)	114 (91.2)
5.	What do you do if there was a power outage?	25 (20.0)	100 (80.0)
6.	At a grocery store, when do you get the chicken?	86 (68.8)	39 (31.2)
Total mean of correct answers: 4.51 ± 2.923			

### E. Association between the KAP scores and demographic characteristics

Table 5 below summarizes the Chi-square test which was done to show which sociodemographic characteristics are significantly associated with the level of knowledge among the respondents. Statistical significance was observed for 9 demographic variables. The location or area of resident ( $p=0.000$ ), gender ( $p=0.000$ ), age ( $p=0.016$ ), education ( $p=0.000$ ), whether participants' work ( $p=0.022$ ), if their job is in the healthcare field ( $p=0.006$ ), their food safety knowledge rating ( $p=0.000$ ), source of food safety information ( $p=0.000$ ), and hours of electricity outage ( $p=0.000$ ).

Table 5 Effect of sociodemographic characteristics on food safety knowledge

	<b>Total (n=125)</b>	<b>Insufficient Knowledge n(%)</b>	<b>Good Knowledge n(%)</b>	<b>Significance</b>
<b>Location</b>				
Hamra	24	1(4.2)	23(95.8)	<b>P=0.000</b> $X^2=36.873$
Dahye	19	5(26.3)	14(73.7)	
Ashrafieh	18	1(5.6)	17(94.4)	
Bourj Hammoud	22	6(27.3)	16(72.7)	
Tarik el Jdideh	20	7(35.0)	13(65.0)	
Ouzai	22	17(77.3)	5(22.7)	
<b>Gender</b>				
Male	48	17(35.4)	31(64.6)	<b>P=0.000</b> $X^2=36.873$
Female	77	20(26.0)	57(74.0)	
<b>Nationality</b>				
Lebanese	105	28(26.7)	77(73.3)	P=0.101 $X^2=7.749$
Syrian	10	6(60.0)	4(40.0)	
Palestinian	6	3(50.0)	3(50.0)	
French	2	0(0.0)	2(100.0)	
American	2	0(0.0)	2(100.0)	
<b>Age</b>				
18-29	15	1(6.7)	14(93.3)	<b>P=0.016</b> $X^2=10.391$
30-42	45	10(22.2)	35(77.8)	
43-55	46	16(34.8)	30(65.2)	
56-64	19	10(52.6)	9(47.4)	
<b>Education</b>				
No formal education	9	8(88.9)	1(11.1)	<b>P=0.000</b> $X^2=21.778$
High school	42	16(38.1)	26(61.9)	
	74	13(17.6)	61(82.4)	

University degree or higher				
<b>Health status</b>				
Pregnant	9	3(33.3)	6(66.7)	P=0.069 X <sup>2</sup> =7.087
Immunocompromised	7	4(57.1)	3(42.9)	
Healthy	87	20(23.0)	67(77.0)	
Other	22	10(45.5)	12(54.5)	
<b>Do you work?</b>				
Yes	67	14(20.9)	53(79.1)	P=0.022 X <sup>2</sup> =5.250
No	58	23(39.7)	35(60.3)	
<b>Is your work in the healthcare field?</b>				
Yes	21	1(4.8)	20(95.2)	P=0.006 X <sup>2</sup> =7.473
No	104	36(34.6)	68(65.4)	
<b>Food safety knowledge rating</b>				
Good	40	3(7.5)	37(92.5)	P=0.000 X <sup>2</sup> =25.165
Satisfactory	67	21(31.3)	46(68.7)	
Poor	18	13(72.2)	5(27.8)	
<b>Source of food safety information</b>				
Social media	53	17(32.1)	36(67.9)	P=0.000 X <sup>2</sup> =20.569
Friends/family members	37	19(51.4)	18(48.6)	
Scientific journals	35	1(2.9)	34(97.1)	
<b>How many hours does the electricity go off?</b>				
1-3 hours	13	1(7.7)	12(92.3)	P=0.000 X <sup>2</sup> =16.113
4-6 hours	45	6(13.3)	39(86.7)	
6+ hours	67	30(44.8)	37(55.2)	

\*A score  $\geq 80\%$  ( $\geq 6$  correct answers) was considered as good knowledge (Rabeya et al., 2022).

The Chi-square analysis in table 6 below demonstrates which sociodemographic characteristics are significantly associated with the level of attitude among respondents. Statistical significance was observed for 9 demographic characteristics: location (p=0.000), nationality (p=0.024), education (p=0.000), health status (p=0.020), whether the participants work (p=0.022), if their job is in the healthcare field (p=0.020), their

food safety knowledge rating ( $p=0.023$ ), source of information ( $p=0.000$ ), and electricity cut-off time ( $p=0.013$ ).

Table 6 Effect of sociodemographic characteristics on food safety attitude

	<b>Total (n=125)</b>	<b>Negative attitude n(%)</b>	<b>Positive attitude n(%)</b>	<b>Significance</b>
<b>Location</b>				
Hamra	24	1(4.2)	23(95.8)	<b>P=0.000</b> $X^2=32.154$
Dahye	19	3(15.7)	16(84.2)	
Ashrafieh	18	1(5.55)	17(94.4)	
Bourj Hammoud	22	6(27.3)	16(72.7)	
Tarik el Jdideh	20	5(25.0)	15(75.0)	
Ouzai	22	15(68.2)	7(31.8)	
<b>Gender</b>				
Male	48	10(20.8)	38(79.2)	P=0.417 $X^2=0.657$
Female	77	21(27.3)	56(72.7)	
<b>Nationality</b>				
Lebanese	105	22(20.9)	83(79.0)	<b>P=0.024</b> $X^2=11.197$
Syrian	10	5(50.0)	5(50.0)	
Palestinian	6	4(66.6)	2(33.3)	
French	2	0(0.0)	2(100.0)	
American	2	0(0.0)	2(100.0)	
<b>Age</b>				
18-29	15	2(13.3)	13(86.6)	P=0.465 $X^2=2.557$
30-42	45	11(24.4)	34(75.5)	
43-55	46	11(23.9)	35(76.0)	
56-64	19	7(36.8)	12(63.1)	
<b>Education</b>				
No formal education	9	7(77.7)	2(22.2)	<b>P=0.000</b> $X^2=28.416$
High school	42	17(40.5)	25(59.5)	
University degree or higher	74	7(9.46)	67(90.5)	
<b>Health status</b>				
Pregnant	9	4(44.4)	5(55.5)	<b>P=0.020</b> $X^2=18.932$
Immunocompromised	7	4(57.1)	3(42.9)	
Healthy	87	12(13.7)	75(86.2)	
Other	22	11(50.0)	11(50.0)	
<b>Do you work?</b>				
Yes	67	11(16.4)	56(83.5)	<b>P=0.022</b> $X^2=5.440$
No	58	20(34.4)	38(65.5)	

<b>Is your work in the healthcare field?</b>				
Yes	21	1(4.76)	20(95.2)	<b>P=0.020</b> X <sup>2</sup> =5.434
No	104	30(28.8)	74(71.1)	
<b>Food safety knowledge rating</b>				
Good	40	4(10.0)	36(90.0)	<b>P=0.023</b> X <sup>2</sup> =7.530
Satisfactory	67	20(29.8)	47(70.1)	
Poor	18	7(38.8)	11(61.1)	
<b>Source of food safety information</b>				
Social media	53	15(28.3)	38(71.7)	<b>P=0.000</b> X <sup>2</sup> =18.640
Friends/family members	37	16(43.2)	21(56.7)	
Scientific journals	35	0(0.0)	35(100.0)	
<b>How many hours does the electricity go off?</b>				
1-3 hours	13	0(0.0)	13(100.0)	<b>P=0.013</b> X <sup>2</sup> =8.739
4-6 hours	45	8(17.7)	37(82.2)	
6+ hours	67	23(34.3)	44(65.7)	

\*A score  $\geq 80\%$  ( $\geq 3$  correct answers) was considered as positive attitude (Rabeya et al., 2022)

Regarding the food safety practices in table 7, statistically significant variables included location ( $p=0.002$ ), nationality ( $p=0.013$ ), age ( $p=0.026$ ), education ( $p=0.055$ ), health status ( $p=0.017$ ), if their job was in the healthcare sector ( $p=0.044$ ), their food safety rating ( $p=0.012$ ), source of information ( $p=0.001$ ), and electricity cut-off hours ( $p=0.005$ ).

Table 7 Effect of sociodemographic characteristics on food safety practices

	<b>Total (n=125)</b>	<b>Bad Practices n(%)</b>	<b>Good practices n(%)</b>	<b>Significance</b>
<b>Location</b>				
Hamra	24	15(62.5)	9(37.5)	<b>P=0.002</b> X <sup>2</sup> =18.649
Dahye	19	17(89.5)	2(10.5)	
Ashrafieh	18	9(50.0)	9(50.0)	
Bourj Hammoud	22	19(86.4)	3(13.6)	
Tarik el Jdideh	20	17(85.0)	3(15.0)	
Ouzai	22	21(95.4)	1(4.5)	
<b>Gender</b>				
Male	48	42(87.5)	6(12.5)	P=0.051 X <sup>2</sup> =3.810
Female	77	56(72.7)	21(27.3)	
<b>Nationality</b>				
Lebanese	105	81(77.1)	24(22.8)	<b>P=0.013</b> X <sup>2</sup> =12.718
Syrian	10	10(100.0)	0(0.0)	
Palestinian	6	6(100.0)	0(0.0)	
French	2	1(50.0)	1(50.0)	
American	2	0(0.0)	2(100.0)	
<b>Age</b>				
18-29	15	12(80.0)	3(20.0)	<b>P=0.026</b> X <sup>2</sup> =9.299
30-42	45	29(64.4)	16(35.5)	
43-55	46	39(84.7)	7(15.2)	
56-64	19	18(94.7)	1(5.2)	
<b>Education</b>				
No formal education	9	9(100.0)	0(0.0)	<b>P=0.055</b> X <sup>2</sup> =5.814
High school	42	36(85.7)	6(14.2)	
University degree or higher	74	53(71.6)	21(28.4)	
<b>Health status</b>				
Pregnant	9	4(44.4)	5(55.5)	<b>P=0.017</b> X <sup>2</sup> =10.188
Immunocompromised	7	7(100.0)	0(0.0)	
Healthy	87	67(77.0)	20(22.9)	
Other	22	20(90.9)	2(9.1)	
<b>Do you work?</b>				
Yes	67	50(74.6)	17(25.4)	P=0.271 X <sup>2</sup> =1.214
No	58	48(82.8)	10(17.2)	
<b>Is your work in the healthcare field?</b>				
Yes	21	13(61.9)	8(38.1)	<b>P=0.044</b> X <sup>2</sup> =4.055
No	104	85(81.7)	19(18.3)	

<b>Food safety knowledge rating</b>				
Good	40	25(62.5)	15(37.5)	<b>P=0.012</b> X <sup>2</sup> =8.904
Satisfactory	67	57(85.0)	10(14.9)	
Poor	18	16(88.8)	2(11.1)	
<b>Source of food safety information</b>				
Social media	53	44(83.0)	9(16.9)	<b>P=0.001</b> X <sup>2</sup> =13.984
Friends/family members	37	34(91.9)	3(8.11)	
Scientific journals	35	20(57.1)	15(42.8)	
<b>How many hours does the electricity go off?</b>				
1-3 hours	13	8(61.5)	5(38.5)	<b>P=0.005</b> X <sup>2</sup> =10.762
4-6 hours	45	30(66.6)	15(33.3)	
6+ hours	67	60(89.5)	7(10.4)	

\*A score  $\geq 80\%$  ( $\geq 5$  correct answers) was considered as positive practice (Rabeya et al., 2022).

Simple and multiple logistic regression analysis was done and is illustrated in table 8. It examines the relationship of the sociodemographic characteristics with the likelihood of having a good level of knowledge as the dependent variable. Using results from the simple logistic regression, variables significantly associated with the likelihood to have good level of knowledge in the study population included location, age, education, health status, whether they work, if their job is in the health sector, their food safety knowledge rating, source of food safety information, and electricity cut-off hours. As for the age, those between the age of 30-42 had higher odds of having good level of knowledge compared to those between 18-29 years old. Moreover, those between 43-55 had higher odds of having good level of knowledge compared to those between 18-29 years old. (30-42: OR = 15.556, p = 0.015; 43-55: OR = 3.889, p = 0.02). Also, for education, those with a high school degree or university degree had higher odds of good knowledge compared to those with no previous education (OR=1.027 p=0.001, OR= 2.346, p=0.016 respectively). Moreover, those who do not work had

higher odds of having good knowledge compared to those who work (OR=2.488, p=0.024). Participants whom reported having satisfactory knowledge on food safety had higher odds (OR=32.067, CI: 6.707,153.309) of having good knowledge compared to those whom reported good knowledge. On the other hand, those who answered friends/family members as their primary source of information had lower odds of having good knowledge compared to those who answered social media their primary source with OR=0.062, p=0.009).

The final multiple logistic model included: the location, health status as immunocompromised, and satisfactory food safety knowledge rating. Participants who mentioned being immunocompromised were 35.281 times more likely to have a good food safety knowledge compared to those who reported being healthy (p=0.027). Participants who reported a satisfactory knowledge rating were 0.025 times less likely of having a good level of knowledge than those who reported a good knowledge rating (p=0.009).

Table 8 Logistic regression analysis: The associations of the sociodemographic characteristics with the likelihood of having good knowledge

	<b>Simple logistic regression OR 95%CI</b>	<b>Multiple logistic regression OR 95%CI</b>
<b>Location</b>		
Hamra	1	1
Dahye	<b>78.200(8.353,732.124), p=0.000</b>	<b>0.006(0.000,0.225), p=0.005</b>
Ashrafieh	<b>9.520(2.285,39.671), p=0.002</b>	<b>0.049(0.004,0.569), p=0.016</b>
Bourj Hammoud	<b>57.800(6.093,548.292), p=0.002</b>	<b>0.006(0.000,0.236), p=0.006</b>
Tarik el Jdideh	<b>9.067(2.306,35.650), p=0.000</b>	<b>0.050 (0.006,0.388), p=0.004</b>
Ouzai	<b>6.314(1.627,24.502), p=0.008</b>	<b>0.099(0.013,0.756), p=0.026</b>
<b>Gender</b>		
Male	1	
Female	0.640(0.293,1.397) p=0.262	
<b>Nationality</b>		
Lebanese	1	

Syrian	0.000(0.000,-) p=0.999	
Palestinian	0.000(0.000,-) p=0.999	
French	0.000(0.000,-) p=0.999	
American	1.000(0.000,-) p=1.000	
<b>Age</b>		
18-29	1	1
30-42	<b>15.556(1.690,143.174)</b>	0.446(0.028,7.033), p=0.566
43-55	<b>p=0.015</b>	0.164(0.025,1.081), p=0.060
56-64	<b>3.889(1.241,12.188) p=0.020</b>	0.451(0.079,2.561), p=0.369
	2.083(0.703,6.161) p=0.185	
<b>Education</b>		
No formal education	1	1
High school	<b>1.027(0.003,2.232) p=0.001</b>	8.687(0.375,201.461), p=0.178
University degree or higher	<b>2.346(1.146,3.82) p=0.016</b>	0.689 (0.156,3.042), p=0.623
<b>Health status</b>		
Healthy	1	1
Immunocompromised	1.667(0.330,8.423) p=0.537	<b>35.281(1.490,835.365),</b>
Pregnant	0.625(0.112,3.477) p=0.591	<b>p=0.027</b>
Other	<b>2.792(1.051,7.413) p=0.039</b>	7.433(0.556,99.428), p=0.130
		2.845(0.436,18.571), p=0.275
<b>Do you work?</b>		
Yes	1	1
No	<b>2.488(1.129,5.480) p=0.024</b>	3.086(0.561,16.976), p=0.195
<b>Is your work in the healthcare field?</b>		
Yes	1	1
No	<b>10.588(1.365,82.133) p=0.024</b>	0.884(0.049,16.015), p=0.934
<b>Food safety knowledge rating</b>		
Good	1	1
Satisfactory	<b>32.067(6.707,153.309)</b>	<b>0.025(0.002,0.395), p=0.009</b>
Poor	<b>p=0.000</b>	0.275(0.043,1.773), p=0.174
	<b>5.695(1.797,18.047) p=0.003</b>	
<b>Source of food safety information</b>		
Social media	1	1
Friends/family members	<b>0.062(0.008,0.494) p=0.009</b>	6.217(0.466,82.878), p=0.167
Scientific journals	<b>0.028(0.003,0.225) p=0.001</b>	6.435(0.484,85.499), p=0.158
<b>How many hours does the electricity go off?</b>		
1-3 hours	1	1
4-6 hours	<b>9.730(1.196,79.142) p=0.033</b>	2.087(0.092,47.106), p=0.644
6+ hours	<b>5.270(1.968,14.116) p=0.001</b>	2.086(0.308,14.120), p=0.451

Simple logistic regression analysis showed that the variables significantly associated with the likelihood to have positive attitude in the study population were location, education, health status, work, food knowledge rating. Participants living in Dahye had higher odds of obtaining a good attitude level compared to those residing in Hamra area (OR=49.286, p=0.000). In addition, those having a university degree had lower odds of obtaining a good level of attitude in comparison to those without a formal education (OR=0.154, p=0.000). Participants having “other” health issues had the highest odds of having a good level of attitude compared to healthy individuals (OR=6.250, p=0.001). On the other hand, participants who reported having satisfactory food safety knowledge had higher odds of having a positive attitude when in comparison to those participants who reported a good food knowledge rating (OR=5.727, p=0.015). The results of the multiple logistic analysis showed that the likelihood to score a positive attitude was significantly associated with the area of residence and education level. For instance, participants that lived in Dahye had lower odds of having a positive attitude compared to those living in Hamra (OR=0.036, p=0.006). Moreover, those with a college education were 7.442 times more likely to have a positive attitude towards food safety compared to those with no previous formal education (p=0.005).

Table 9 Simple and multiple logistic regression analysis for the associations of the socio-demographic characteristics with the likelihood of having positive attitude

	<b>Simple logistic regression OR 95%CI</b>	<b>Multiple logistic regression OR 95%CI</b>
<b>Location</b>		
Hamra	1	1
Dahye	<b>49.286(5.494,442.115), p=0.000</b>	<b>0.036(0.003,0.385), p=0.006</b>
Ashrafieh		<b>0.082(0.012,0.558), p=0.011</b>
Bourj Hammoud	<b>11.429(2.487,52.513), p=0.002</b>	<b>0.053(0.004,0.625), p=0.020</b>

Tarik el Jdideh Ouzai	<b>36.429(4.007,331.187), p=0.001</b> <b>5.714(1.560,20.929), p=0.008</b> <b>6.429(1.662,24.860), p=0.007</b>	<b>0.133(0.024,0.744), p=0.022</b> <b>0.192(0.037,0.995), p=0.049</b>
<b>Gender</b> Male Female	1 1.425(0.604,3.362), p=0.419	
<b>Nationality</b> Lebanese Syrian Palestinian French American	1 0.000(0.000, -), p=0.999 0.000(0.000, -), p=0.999 0.000(0.000, -), p=0.999 1.000(0.000, -), p=1.000	
<b>Age</b> 18-29 30-42 43-55 56-64	1 3.792(0.655,21.961), p=0.137 1.803(0.569,5.716), p=0.317 1.856(0.586,5.876), p=0.293	
<b>Education</b> No formal education High school University degree or higher	1 <b>0.030(0.005,0.172), p=0.000</b> <b>0.154(0.057,0.415), p=0.000</b>	1 <b>52.077(2.426,1117.752), p=0.012</b> <b>7.442(1.845,30.022), p=0.005</b>
<b>Health status</b> Healthy Immunocompromised Pregnant Other	1 1.250(0.263,5.936), p=0.779 0.750(0.135,4.165), p=0.742 <b>6.250(2.222,17.582), p=0.001</b>	1 3.862(0.338,44.083), p=0.277 4.264(0.397,45.798), p=0.231 0.587(0.122,2.826), p=0.507
<b>Do you work?</b> Yes No	1 <b>2.679(1.153,6.226), p=0.022</b>	1 2.511(0.613,10.295), p=0.201
<b>Is your work in the healthcare field?</b> Yes No	1 <b>8.108(1.041,63.152), p=0.046</b>	1 0.568(0.040,8.037), p=0.676
<b>Food safety knowledge rating</b> Good Satisfactory Poor	1 <b>5.727(1.410,23.267), p=0.015</b> 1.495(0.507,4.415), p=0.466	1 2.102(0.164,26.906), p=0.568 3.675(0.514,26.271), p=0.195
<b>Source of food safety information</b> Social media Friends/family members Scientific journals	1 0.000(0.000, -), p=0.998 0.000(0.000, -), p=0.998	
<b>How many hours does the electricity go off?</b> 1-3 hours	1	

4-6 hours	8.444(0.000, -), p=0.999	
6+ hours	2.418(0.968,6.040), p=0.059	

In table 10, simple and multiple logistic regression analysis was used for the participants' practices regarding food safety. Consumers who resided in Bourj Hammoud had higher odds of having good practice levels compared to individuals residing in Hamra (OR=21.000, p=0.007). Furthermore, those between the ages of 43-55 years old had higher odds of good practice levels compared to those between 18-29 years old (OR=9.931, p=0.032). Participants who had low immunity had higher odds of having a good level of practice compared to healthy participants (OR=12.500, p=0.012). The source of information, was also significantly associated with practice level. In addition, for the electricity cut-off time, participants who had cutoff hours between 4-6 hours (OR=5.357, p=0.016) and 6+ hours (OR=4.286, p=0.004) had higher odds of having a good practice level compared to those who had cutoff hours of 1-3 hours. Multiple regression revealed significant difference in only the participant's source of food safety information with those who get their food safety information from friends or family members had higher odds of a good level of practice compared to participants whose source of information is social media (OR= 4.020, p=0.030).

Table 10 Simple and multiple logistic regression analysis for the associations of the socio-demographic characteristics with the likelihood of having good practices

	<b>Simple logistic regression OR</b> <b>95%CI</b>	<b>Multiple logistic regression</b> <b>OR 95%CI</b>
<b>Location</b> Hamra Dahye Ashrafieh Bourj Hammoud Tarik el Jdideh Ouzai	1 <b>12.600(1.439,110.314),</b> <b>p=0.022</b> 2.471(0.206,29.625), p=0.475 <b>21.000(2.307,191.168),</b> <b>p=0.007</b> 3.316(0.317,34.654), p=0.317 3.706(0.353,38.927), p=0.275	1 0.237(0.015,3.655), p=0.303 2.068(0.087,49.246), p=0.653 0.194(0.010,3.796), p=0.280 0.626(0.049,7.988), p=0.718 0.650(0.043,9.886), p=0.757
<b>Gender</b> Male Female	1 0.381(0.141,1.027), p=0.056	
<b>Nationality</b> Lebanese Syrian Palestinian French American	1 0.000(0.000, -), p=0.999 0.000(0.000, -), p=0.999 0.000(0.000, -), p=0.999 0.000(0.000, -), p=0.999	
<b>Age</b> 18-29 30-42 43-55 56-64	1 4.500(0.417,48.531), p=0.215 <b>9.931(1.211,81.435), p=0.032</b> 3.231(0.369,28.252), p=0.289	1 1.896(0.120,30.034), p=0.650 0.274(0.025,3.020), p=0.290 0.728(0.064,8.256), p=0.798
<b>Education</b> No formal education High school University degree or higher	1 0.000(0.000, -), p=0.999 0.421(0.155,1.145), p=0.090	

<b>Health status</b> Healthy Immunocompromised Pregnant Other	1 <b>12.500(1.761,88.738), p=0.012</b> 0.000(0.000, -), p=0.999 2.985(0.642,13.882), p=0.163	1 0.125(0.011,1.419). p=0.093 57210897.9(57210897.9, 57210897.9), p=- 0.506(0.076,3.353), p=0.480
<b>Do you work?</b> Yes No	1 1.632(0.680,3.918), p=0.273	
<b>Is your work in the healthcare field?</b> Yes No	1 2.753(1.001,7.570), p=0.050	
<b>Food safety knowledge rating</b> Good Satisfactory Poor	1 4.800(0.966,23.853), p=0.055 1.404(0.279,7.066), p=0.681	
<b>Source of food safety information</b> Social media Friends/family members Scientific journals	1 <b>0.273(0.102,0.727), p=0.009</b> <b>0.118(0.030,0.457), p=0.002</b>	1 <b>4.020(1.140,14.173), p=0.030</b> 4.080(0.766,21.740), p=0.100
<b>How many hours does the electricity go off?</b> 1-3 hours 4-6 hours 6+ hours	1 <b>5.357(1.369,20.962), p=0.016</b> <b>4.286(1.579,11.632), p=0.004</b>	1 0.461(0.050,4.255), p=0.495 0.490(0.090,2.679), p=0.411

#### F. Association between the different KAP scores

The three tables below: 11, 12 and 13 all showed significant associations (p=0.000) between the different KAP levels. For instance, in table 11, the odds of having negative attitude given insufficient knowledge are 6.709 times higher compared to when participants have good knowledge. Moreover, in table 12, the odds of having a negative

practice given insufficient knowledge are 6.947 times higher than when having good knowledge. On the other hand, as seen in table 13, having negative practices is more likely when participants have a negative attitude than when they have positive one (OR= 5.261, CI: 4.236, 6.827).

Table 11 Association between the level of knowledge and attitude

	<b>Total (n=125)</b>	<b>Negative attitude (%)</b>	<b>Positive attitude (%)</b>	<b>Significance</b>	<b>OR (CI)</b>
Insufficient Knowledge	37	61.3	19.1	<b>P=0.000</b> $X^2 = 19.867$	6.709(4.134,9.262)
Good Knowledge	88	38.7	80.9		

Table 12 Association between the level of knowledge and practices

	<b>Total (n=125)</b>	<b>Negative practice (%)</b>	<b>Positive practice (%)</b>	<b>Significance</b>	<b>OR (CI)</b>
Insufficient Knowledge	37	35.7	7.4	<b>P=0.000</b> $X^2 = 8.140$	6.947(3.540,7.712)
Good Knowledge	88	64.3	92.6		

Table 13 Association between the level of attitude and practices

	<b>Total (n=125)</b>	<b>Negative practice (%)</b>	<b>Positive practice (%)</b>	<b>Significance</b>	<b>OR (CI)</b>
Negative attitude	31	29.6	7.4	<b>P=0.000</b> $X^2 = 5.586$	5.261(4.236,6.827)
Positive attitude	94	70.4	92.6		

## CHAPTER IV

### DISCUSSION

Overall, the aim of this study was to explore the knowledge, attitude and practices towards food safety related to the handling of poultry in Beirut, Lebanon among consumers. According to the data, it was observed that respondents had inadequate levels of knowledge, adequate level of attitudes, and bad practices. After analysis, it was found that the total mean score of correct answers to the knowledge questions was  $4.53 \pm 2.165$  (<80%), which showed a bad level of knowledge among the participants. However, other studies were done in Lebanon which indicated an insufficient knowledge level of consumers and placed importance on the need for awareness, education courses, and training among the population (Evans et al., 2021). This could be attributed to the sample size and the scoring rubric used for instance.

As for the attitude section, the total mean score of correct answers was  $3.34 \pm 1.56$  (>80%), since it was above the cut point, it indicated a positive attitude among the consumers. A comparable result was also found in a study done in Malaysia (Pengetahuan et al., 2011) whereby females scored higher on the attitude section and younger respondents needed more food safety education. Another study done in Iran also exhibited excellent food safety attitudes among the food handlers (Ansari-Lari et al., 2010). It was established that there was a significant positive correlation between the attitude and knowledge of the food handler. On the other hand, in a study that was done in Portugal at a university campus, it was acknowledged that the knowledge of the food handlers was irrespective of their food safety attitudes (Soares et al., 2016). Whereas a study done by Santos et al., 2009, had higher scores of correct attitudes of

the food handlers. In this study, 88.8% of respondents had a positive attitude regarding performing food processing activities with injured hands.

For the practices section, the total mean score of correct answers was  $4.51 \pm 2.923$ , which indicated bad practices among the consumers in this sample (<80%). It is important to maintain proper food safety practices in order not to contract any food-borne illnesses. In this study, negative practices were shown with regards to defrosting chicken as 58.4% had bad practices. Moreover, for assuring that the chicken is clean before cooking, 75.2% of the consumers also had bad practices. This can affect the safety of chicken upon consumption as *Salmonella* may be present if insufficient hygiene and safety practices are applied. A study done in Bangladesh (Meher et al., 2022) concluded that the practices of the food handlers was bad as the food handlers had a lack of knowledge about food safety which is correlated with their negative hygiene practices. Moreover, it was shown that consumers' food safety knowledge had an impact on their food safety practices. A study done amongst Irish consumers (Conway et al., 2022) found that the majority of the participants (72.1%) were aware that raw foods such as chicken must be segregated from ready to eat and cooked foods. However, in this present study, only 52% of the participants knew that.

However, unlike other studies where gender was a statistically significant variable (Haque et al, 2018), in this study, gender did not impact attitudes nor practices. There was an association between knowledge and practices, like other studies (Siddiky et al., 2022) whereby practices were associated with food handlers' knowledge. 80% of the consumers answered incorrectly to how long chicken lasts in the refrigerator, and 75.2% had bad practices when it came to the method of assuring the chicken is clean

before cooking. Therefore, there is a need for rigorous educational and training programs in Beirut, Lebanon.

As for the limitations of the study, the sample of participants that were surveyed may not be fully representative of the general Lebanese population as only 6 areas in Beirut were visited. A bias that may be present is the social desirability bias, whereby participants would respond in a way that deemed positive to the interviewer, hereby not answering truthfully. Moreover, this study employed quantitative methods of assessments, and future research endeavors may benefit from also incorporating qualitative methods for a more comprehensive understanding of the subject.

## CHAPTER V

### CONCLUSION

Overall, the participants had unsatisfactory knowledge towards food safety such as the storage conditions of chicken. This could be related to the education level of the consumers. Moreover, respondents had an overall positive attitude towards food safety but they had bad practices. Bad practices were mostly related to defrosting chicken, checking the temperature of the fridge, and method of checking the poultry is clean before cooking. This calls for more training programs in Lebanon towards food safety in the kitchens. This can aid in reducing food-borne diseases in Lebanon among consumers. More awareness on the risks of *Salmonella* in chicken should be promoted and more studies and data in Lebanon are needed as they are scarce.

APPENDIX I  
INVITATION SCRIPT



**AUB Social & Behavioral Sciences**  
**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 “Knowledge, Attitudes and Practices towards poultry handling and *Salmonella* risk among households in Beirut, Lebanon.”

You will be asked to complete a short survey/questionnaire that consists of socio-demographic information, knowledge, attitudes, and practices.

You are invited because we are targeting adults living in Beirut whom are food handlers

The estimated time to complete this interview is approximately 5-10 minutes

The research is conducted via a face-to-face interview with residents of Beirut

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 (Dana Ataya, 76950846, dha23@mail.aub.edu)

## APPENDIX II

### CONSENT FORM



#### Consent Form

##### File S1. Consent form

Dear Participant,

You are invited to participate in a research study entitled “Knowledge, Attitudes, and Practices towards poultry handling and *Salmonella* risk among households in Beirut, Lebanon.”

This study is conducted by Dr. Samer Kharroubi, Department of Nutrition and Food Sciences, American University of Beirut. The main objectives of this study are to investigate the knowledge, attitudes, and practices of individuals residing in Beirut towards poultry handling, explore associations with sociodemographic characteristics, and examine the food-borne risk factors.

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 125 people from different areas in Beirut
- **The recruitment of the participants will be through face-to-face interviews**
- Completing the oral questionnaire 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**

There are no direct benefits, however, findings from the present study will identify gaps to improve knowledge and attitudes about handling chicken and raise awareness on the risks of *Salmonella* infections and improper handling of chicken among individuals living in Beirut. Furthermore, findings will aim to reduce and prevent food-borne illnesses from *Salmonella* spp. and intend to improve the food safety practices among households.

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

There are no potential risks involved and your participation in this survey does not involve any distress whether mentally or physically, since no personal identifiers or sensitive information will be asked.

## **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 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 interview questions.



## نموذج الموافقة

عزيزي المشارك،

أنت مدعو للمشاركة في دراسة بحثية بعنوان "المعرفة والمواقف والممارسات تجاه التعامل مع الدجاج ومخاطر السالمونيلا بين الأسر في بيروت ، لبنان."

أجرى هذه الدراسة الدكتور سامر خروبي ، قسم التغذية وعلوم الغذاء ، الجامعة الأمريكية في بيروت. الهدف الرئيسي من هذه الدراسة هو التحقق في معارف واتجاهات وممارسات الأفراد المقيمين في بيروت تجاه التعامل مع الدجاج.

تدعوك هذه الرسالة لقراءة وثيقة الموافقة والتفكير فيما إذا كنت تريد المشاركة في الدراسة. ويلاحظ أن:

- هذه ليست رسالة رسمية من الجامعة الأميركية في بيروت
- المشاركة طوعية تماما
- ستشمل هذه الدراسة عينة من 125 شخصا من مناطق مختلفة في بيروت
- سيتم تعيين المشاركين من خلال المقابلات وجهاً لوجه
- سوف يستغرق إكمال الاستبيان حوالي 5-10 دقائق
- سيتم جمع وتحليل البيانات التي تقدمها في الاستبيان فقط.
- يكون الاستبيان مجهول الهوية ولا توجد معلومات شخصية أو معلومات تعريفية.
- لا يستطيع فريق البحث الوصول إلى اسمك أو تفاصيل الاتصال بك
- سيتم مراقبة البيانات التي تم جمعها وقد يتم تدقيقها من قبل مجلس الهجرة واللجنة مع ضمان السرية
- يمكنك تنزيل نموذج الموافقة إذا كنت ترغب في الاحتفاظ بنسخة

### الفوائد المحتملة للمواطنين و / أو المجتمع

لا يتوقع فوائد مباشرة. ومع ذلك ، ستحدد نتائج الدراسة الحالية الثغرات لتحسين المعرفة والمواقف حول التعامل مع الدجاج وزيادة الوعي حول مخاطر السالمونيلا والتعامل غير السليم بين الأفراد الذين يعيشون في بيروت. علاوة على ذلك ، ستهدف النتائج إلى التخفيف من التسمم الغذائي والأمراض بين هذه العينة

## المخاطر المحتملة على الأفراد و / أو المجتمع

مخاطر الدراسة ضئيلة ولا تنطوي مشاركتك في هذا الاستطلاع على أي ضرر لأنني لن أطلب معلومات حساسة.

## خصوصية

ستبقى البيانات التي تم جمعها سرية ومجهولة المصدر. سيتم تخزينها على جهاز كمبيوتر المحقق الخاص المحمي بكلمة مرور ، ولن يتمكن سوى فريق البحث من الوصول إليه. ستتم مراقبة البيانات وقد يتم تدقيقها من قبل مجلس الهجرة واللجان مع ضمان السرية.

سنستخدم المعلومات التي تم جمعها من الاستطلاعات لمشروع أطروحة الماجستير لدينا ، وهو شرط للحصول على درجتنا في قسم التغذية وعلوم الغذاء. سيتم استخدام نتائج هذه الدراسة لأغراض البحث فقط.

## المشاركة والانسحاب

إذا وافقت طواعية على المشاركة في هذه الدراسة ، فيمكنك تغيير رأيك والانسحاب في أي وقت دون عواقب من أي نوع. لن يترتب على رفض المشاركة في الدراسة أي عقوبة أو خسارة في الامتيازات التي يحق لك الحصول عليها بخلاف ذلك. كما أن رفضك للمشاركة في الدراسة لن يؤثر على علاقتك بالجامعة الأميركية في بيروت.

## أسئلة حول الدراسة

إذا كان لديك أي أسئلة أو مخاوف بشأن الدراسة ، يمكنك الاتصال بالدكتور سامر خروبي على [sk157@aub.edu.lb](mailto:sk157@aub.edu.lb)

## مخاوف أو أسئلة حول حقوقك

إذا كانت لديك مخاوف بشأن الدراسة أو أسئلة حول حقوقك كمشارك ، يمكنك الاتصال بمجلس المراجعة الاجتماعية والسلوكية للجامعة الأميركية في بيروت (IRB) على [irb@aub.edu.lb](mailto:irb@aub.edu.lb) أو الرقم الداخلي للجامعة الأميركية في بيروت: 5445.

## الوصول إلى الاستطلاع

إذا كنت بعد قراءة وثيقة الموافقة والإجابة على أسئلتك ، فإنك توافق طواعية على المشاركة في الدراسة ، يمكنك الوصول إلى الاستبيان من خلال الإجابة على أسئلة المقابلة.

## APPENDIX III

### QUESTIONNAIRE

#### **A) Socio-demographic Characteristics**

1. What is your gender?
  - a. Male
  - b. Female
  - c. I prefer not to answer
  
2. What is your nationality?
  - a. Lebanese
  - b. Non-Lebanese, please specify \_\_\_\_\_
  
3. What is your age group?
  - a. 18- 29
  - b. 30- 42
  - c. 43- 55
  - d. 56- 64
  
4. What is your educational level?
  - a. No formal education
  - b. High School
  - c. University Degree or higher
  
5. Do you or someone in the household have any health concerns?
  - a. Pregnant
  - b. Immunocompromised
  - c. Healthy
  - d. Other: \_\_\_\_\_
  
6. Do you work?
  - a. Yes
  - b. No
  
7. If you answered yes to the above question, is your job in the healthcare field? (Medicine, Nutrition...)
  - a. Yes
  - b. No
  
8. Rate your food safety knowledge:
  - a. Good
  - b. Satisfactory
  - c. Poor

9. Where do you get your food safety information from?
- Social media
  - Friends/family members
  - Scientific journals
10. How many hours a day does the electricity go off in your house?
- 1-3 hours
  - 4-6 hours
  - 6+ hours

## **B) Knowledge**

11. Food poisoning can be life-threatening:
- Yes
  - No
  - I don't know
12. What's the **main** source of *Salmonella*?
- Vegetables, meat, chicken
  - Eggs, grains
  - Chicken, eggs
  - All of the above
13. The refrigerator temperature when storing chicken must be:
- Below 10°C
  - Below 5°C
  - 12-15°C
  - I don't know
14. Hand washing before preparing chicken may reduce risks of food poisoning
- Correct
  - Incorrect
  - I don't know
15. *Salmonella* may be transmitted by:
- Cross-contamination
  - Eating undercooked/raw eggs and chicken
  - Not washing hands
  - All the above

16. Saliva through sneezing is a way of contamination
- a. Correct
  - b. Incorrect
  - c. I don't know
17. If there was a power outage, how long can chicken last in a full freezer?
- a. 10 hours
  - b. 48 hours
  - c. 72 hours
  - d. I don't know
18. How long can you store raw chicken in the refrigerator?
- a. 1-2 days
  - b. 3-4 days
  - c. 5-6 days
  - d. I don't know

### **C) Attitudes**

19. Do you believe that raw, cooked, and leftover food can be stored in the same part in the refrigerator?
- a. Agree
  - b. Disagree
  - c. I don't know
20. Do you think that you should not perform food processing activities with injured hands?
- a. Agree
  - b. Disagree
  - c. I don't know
21. Do you believe that using different cutting boards and knives for raw vs. ready-to-eat foods may reduce cross-contamination?
- a. Agree
  - b. Disagree
  - c. I don't know
22. Do you think that chicken can be consumed medium rare (still pink from inside)?
- a. Agree

- b. Disagree
- c. I don't know

#### **D) Practices**

23. How do you defrost your chicken?
- a. Leave it on the counter for 2+ hours
  - b. In the microwave
  - c. In the fridge
24. Do you disinfect surfaces after handling raw poultry?
- a. Yes
  - b. No
25. How do you assure the chicken is clean before cooking?
- a. I wash it with water
  - b. I just remove the skin or add vinegar
  - c. I directly cook it without any cleaning step
26. Do you regularly check the temperature of your freezers/fridges to reduce the risk of food poisoning?
- a. Yes
  - b. No
27. What do you do if there was a power outage?
- a. Cook the product if it was in the refrigerator
  - b. Transfer the product from the refrigerator to the freezer
  - c. Don't open the refrigerator door
  - d. I do nothing
28. At a grocery store, when do you get the chicken?
- a. At the beginning
  - b. At the end
  - c. It doesn't matter
29. How often do you prepare meals at home?
- a. At least five times per week
  - b. Three to five times per week
  - c. One or two times per week

d. Never

30. Where do you get your raw chicken from?

- a. Known brands
- b. Less popular brands
- c. It doesn't matter

31. You purchase your chicken from:

- a. The supermarket
- b. The brand store directly
- c. Online

أ) الخصائص الاجتماعية والديموغرافية

1. ما هو جنسك؟

أ. ذكر

ب. أنثى

ج. لا أريد أن أجاب

2. ما هي جنسيتك؟

أ. لبناني

ب. غير اللبنانيين، يرجى التحديد \_\_\_\_\_

3. ما هي فنتك العمرية؟

أ. 18-29

ب. 30-42

ج. 41-55

د. 56-64

4. ما هو مستواك التعليمي؟

أ. غير متعلم

ب. المدرسة الثانوية

ج. درجة جامعية أو أعلى

5. هل تعاني أنت أو أحد أفراد أسرتك من مشاكل صحية؟

أ. حامل

ب. الناقص المناعة

ج. متعافي

د. آخر: \_\_\_\_\_

6. هل تشتغل؟

أ. نعم

ب. لا

7. إذا أجبت بنعم على السؤال أعلاه، هل عملك في مجال الرعاية الصحية؟ (طب، تغذية..)

أ. نعم

ب. لا

8. قيم معرفتك بسلامة الغذاء:

أ. جيد جداً

ب. جيد

ج. سيئ

9. من أين تحصل على معلومات سلامة الغذاء الخاصة بك؟

أ. وسائل التواصل الاجتماعي

ب. الأصدقاء / أفراد الأسرة

ج. المجالات العلمية

10. كم ساعة في اليوم تنقطع الكهرباء في منزلك؟

أ. 1-3 ساعات

ب. 4-6 ساعات

ج. +6 ساعات

ب) المعرفة

11. يمكن أن يكون التسمم الغذائي مهدداً للحياة:

أ. أوافق

ب. لا أوافق

ج. لا أعلم

12. ما هو المصدر الرئيسي للسالمونيلا؟

أ. خضار، لحم، دجاج

ب. البيض والحبوب

ج. بيض الدجاج

د. كل ما ورد أعلاه

13. يجب أن تكون درجة حرارة الثلاجة عند تخزين الدجاج:

أ. أقل من 10 درجة مئوية

ب. أقل من 5 درجة مئوية

ج. 12-15 درجة مئوية

د. لا أعلم

14. غسل اليدين قبل تحضير الدجاج قد يقلل من أخطار التسمم الغذائي

أ. صحيح

ب. غير صحيح

ج. لا أعلم

15. يمكن أن تنتقل السالمونيلا عن طريق:

أ. اللمس

ب. تناول البيض والدجاج غير المطبوخ / النيء

ج. عدم غسل اليدين

د. كل ما ورد أعلاه

16. الرذاذ عن طريق العطس هو وسيلة للتلوث:

أ. أوافق

ب. لا أوافق

ج. لا أعلم

17. في حالة انقطاع التيار الكهربائي، ما هي مدة بقاء الدجاج في الثلاجة الممتلئة؟

أ. 10 ساعات

ب. 48 ساعة

ج. 72 ساعة

د. لا أعلم

18. ما هي مدة تخزين الدجاج النيء في الثلاجة؟

أ. 1-2 يوم

ب. 3-4 أيام

ج. 5-6 أيام

د. لا أعلم

**ج) المواقف**

19. هل تعتقد أنه يمكن تخزين الطعام النيء والمطبوخ وبقايا الطعام في نفس الجزء في الثلاجة؟

أ. أوافق

ب. لا أوافق

ج. لا أعلم

20. هل تعتقد أنه لا ينبغي عليك القيام بأنشطة تجهيز الطعام بأيدي مصابة؟

أ. أوافق

ب. لا أوافق

ج. لا أعلم

21. هل تعتقد أن استخدام ألواح التقطيع والسكاكين المختلفة للأغذية النيئة مقابل الأطعمة الجاهزة للأكل قد يقلل من التلوث المتبادل (انتقال التلوث؟)

أ. أوافق

ب. لا أوافق

ج. لا أعلم

22. هل تعتقد أن الدجاج يمكن أن يأكل متوسط النضج؟

أ. أوافق

ب. لا أوافق

ج. لا أعلم

(د) الممارسات

23. كيف تذب دجاجك؟

أ. اتركه على الطاولة لمدة ساعتين أو أكثر

ب. في الميكروويف

ج. في الثلاجة

24. هل يتم تطهير الأسطح بعد التعامل مع الدجاج النيء؟

أ. نعم

ب. لا

25. كيف تتأكد من نظافة الدجاج قبل الطهي؟

أ. أغسله بالماء

- ب. أنا فقط أزيل الجلد أو أضيف الخل  
ج. أطبخها مباشرة دون أي خطوة تنظيف

26. هل تقوم بفحص درجة حرارة المجمدات / الثلاجات بانتظام لتقليل خطر الإصابة بالتسمم الغذائي؟

- أ. نعم  
ب. لا

27. ماذا تفعل في حالة انقطاع التيار الكهربائي؟

- أ. أقم بطهي المنتج إذا كان في الثلاجة  
ب. انقل المنتج من الثلاجة إلى الفريزر  
ج. لا تفتح باب الثلاجة  
د. لا افعل شيء

28. عند الذهاب إلى السوبرماركت، متى تشتري الدجاج؟

- أ. في البداية  
ب. في النهاية  
ج. لا يهم

29. كم مرة تحضر وجبات الطعام في المنزل؟

- أ. خمس مرات على الأقل في الأسبوع  
ب. ثلاث إلى خمس مرات في الأسبوع  
ج. مرة أو مرتين في الأسبوع  
د. أبداً

30. من أين تحصل على الدجاج النيء؟

أ. الماركات/العلامات التجارية المعروفة

ب. الماركات الأقل شهرة

ج. لا يهم

31. من أين تشتري الدجاج النيء؟

أ. سوبر ماركت

ب. العلامة التجارية مباشرة

ج. عبر الانترنت

# APPENDIX IV

## EDUCATIONAL FLYERS

### Salmonella Safety Guide

#### What is *Salmonella*?

It is a pathogenic bacteria that is mainly caused by contaminated food.

- About one million cases per year in the US are from *Salmonella*.

#### Symptoms occur within 12-36 hours

- Nausea/vomiting
- Severe diarrhea
- Abdominal pain
- Fever, chills, headache

#### HOW IT CAN SPREAD:



##### Cross-contamination

Raw foods must be kept separate from cooked and ready to eat foods



##### Food handler

Must not be sick and should be wearing appropriate garments



##### Poor hygiene

Hand washing and personal hygiene practices must be followed

#### TIPS:



Don't wash raw chicken with water



Store chicken at below 4°C in the fridge



Cook chicken to a temperature of 74°C

#### PREVENTION

- Hand washing before and after food preparation
- Keeping equipment clean
- Storing and cooking food to appropriate temperatures

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# دليل الأمان ضد السالمونيلا

## ما هي السالمونيلا ؟

- إنها بكتيريا ممرضة تنتج بشكل رئيسي من الطعام الملوث.
- حوالي مليون حالة سنويا في الولايات المتحدة هي من السالمونيلا.

## تظهر العوارض بين 12-36 ساعة

- . غثيان / قيء .
- . اسهال حاد .
- . وجع بطن .
- . الحمى والقشعريرة وآلام الرأس .

## كيف يمكنها أن تنتشر



### انتقال التلوث

يجب فصل الأطعمة النيئة  
عن الأطعمة المطبوخة  
والجاهزة للأكل



### الشخص الذي يعد الطعام

يجب ألا يكون مريضاً  
ويجب أن يرتدي  
الملابس المناسبة



### سوء النظافة

يجب اتباع ممارسات  
غسل اليدين والنظافة  
الشخصية

## نصائح:

لا تغسل الدجاج النيء بالماء



## الوقاية

- غسل اليدين قبل وبعد تحضير الطعام
- الحفاظ على نظافة المعدات
- تخزين الطعام وطهيته لدرجات حرارة مناسبة

احفظ الدجاج بدرجة حرارة أقل من  
4 درجات مئوية في الثلاجة



اطبخ الدجاج إلى درجة حرارة 74  
درجة مئوية



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