

AMERICAN UNIVERSITY OF BEIRUT

FOOD SAFETY KNOWLEDGE, ATTITUDES AND
PERCEPTIONS (KAPS) AMONG NGOS IN LEBANON:
A CROSS-SECTIONAL STUDY

by
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ABSTRACT

OF THE THESIS OF

Lynn Sami El Berjawi for Master of Science
Major: Food Safety

Title: Food Safety Knowledge, Attitudes, and Perceptions (KAPs) Among NGOs in Lebanon: A Cross-Sectional Study

Food poisoning cases are on the rise in Lebanon recently and specifically due to electricity shortages in most regions. Restaurants, households, and hospitals are currently suffering from food poisoning cases due to the inappropriate storage of food, adding to the previous lack of knowledge and practice of the Lebanese society of food safety. Several studies have shown this lack but no studies have yet been done on the non-profit organization (NGOs) providing food to people in need. Lebanese NGOs have been on the rise and especially after the Beirut blast that happened in August 2020.

We aim to study the knowledge, attitude, and perceptions of the kitchen operational managers (KOM) which reflect the knowledge of the food handlers inside the kitchen, and to further establish necessary recommendations to assist the NGOs in providing safe food to the people in need.

A statistical survey-based study will be conducted with 49 NGOs covering most of the Lebanese regions and the results obtained will be statistically analyzed using SPSS associations will be done between the participants' characteristics such as gender, age, and education with their food safety knowledge, attitudes, and perceptions

Our results showed a positive attitude towards implementing food safety however low knowledge and perceptions scores. It was noticed that the majority of the managers did not know that freezing does not eliminate bacteria (48.8%) or does not follow the best method for vegetable sanitation (73.2%). Results also showed that never taking food safety training would decrease the knowledge score by 4.274 points and the perception score by 4.343 points.

The need for training was highlighted in this study with emphasis on some control measures and practices to be followed to reduce the risk of food poisoning specifically in Lebanon.

This study provides insights for policymakers, consultancy companies, as well as the government in establishing necessary customized training.

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To Mom and Dad

CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

A. Introduction

Food Safety is a major concern around the world with millions of people being hospitalized and dying after consumption of contaminated food (World Health Organization, 2015). Poor food safety practices can lead to foodborne illnesses, which can cause serious health problems and even death. Non-Governmental Organizations (NGOs) have also been on the rise and now with more than 800 NGOs, vulnerable people can get any help they would need from housing, education, moral support and even being provided with daily cooked meals. Prepared food meals must be safe, of good quality, and served at convenient times to prevent any risk of bacterial multiplication. This issue is very critical since most NGOs serve food mostly to the elderly, families with kids, and homeless people. All the listed individuals are considered people at high risk of food poisoning due to their weak immune systems (People With a Higher Risk of Food Poisoning | Food Safety | CDC, 2019). It is highly critical for NGOs to establish correct food safety practices and acquire the necessary food safety knowledge. Unfortunately, there are gaps in food safety knowledge and convenient regarding food safety in NGOs.

Bad personal hygiene, improper handling of the food, and inadequate cleaning and sanitation are direct risks to the food leading to contamination and food poisoning. Cases of food poisoning should decrease among the population and especially the vulnerable population who does not have access to proper medical health care. With the

growing financial, political, and social instability in Lebanon, this vulnerable population is exponentially increasing, and the need for NGO services is increasing as well. The absence of the state in Lebanon has made room for NGOs to be created and grow (Beirut Urban Lab - Is Lebanon Becoming Another “Republic of the NGOs”?, 2020). With the ongoing unpredictable crises, NGOs have been focusing on providing daily prepared meals (hot or cold) to underprivileged people. For this purpose, awareness of the food handlers in NGOs regarding this matter is required. The significance of this study is to start shedding the light on this topic and among this specific study population which might later lead to implementing consultation programs among the NGOs for better food safety practices. Perception regarding the practice is studied in this research and referred to as practices. The results of this study will impact future decisions from government personnel and food safety consultants to take action and carry out laws and recommendations regarding Lebanese NGOs. Once the survey is conducted, if any association between the knowledge and selected variables is found then it will give us a clearer idea of how to further tackle this situation.

B. Food Safety Challenges in Lebanon

There are several challenges that Lebanon faces in ensuring the safety of its food supply.

One major challenge is the lack of government oversight and regulation of the food industry. According to a report done by the American University of Beirut, a series of outdated decrees are still in use nowadays, yet there is no food safety law in Lebanon (Briefing Note Protecting Consumers in Lebanon: The Need for Effective Food Safety System, 2014). Several agencies govern food safety in Lebanon with no control of the

functions of these agencies or coordination of activities among them. The Lebanese Ministry of Public Health is responsible for regulating and inspecting establishments, but it lacks the resources and capacity to adequately carry out these tasks.

Another challenge is the lack of food safety knowledge and training among food handlers. A study done on the knowledge, attitudes, and practices of food handlers in hospitals showed a low knowledge of food handlers that could be improved by continuous training (Bou-Mitri et al., 2018). Another study was done on food handlers in North Lebanon also showed a low knowledge score which was later improved by a food safety intervention, i.e., Training (Halabi et al., 2022)

In addition to this, Lebanon has been facing several high-profile food safety scares in recent years, including outbreaks of foodborne illness caused by contaminated food. This contamination is due to the country's lack of effective waste management systems which can lead to the contamination of soil and water, which can then be passed on to the food supply. Results of preliminary studies done on Akkawi cheese have shown a high level of contamination; 79,000 E. coli per gram of cheese in one region only whereas the permitted level of E. coli concentration in cheese is 100 E. coli per gram and must not exceed 1000 E. coli per gram (Joseph Shkair, 2021). Another preliminary result of a study conducted by Dr. Issmat Kassem on fruits and vegetables from different markets across the country showed a high level of contamination after being washed with tap water from different regions. The study reveals the presence of three different types of bacteria: Fecal Coliforms, Staphylococci, and S. aureus. Although the usual cleaning process was applied to the fruits and vegetables prior to testing, a high level of bacterial contamination remained in the salads.

Lebanon is facing several other challenges such as ensuring the safety of its food supply, economic and political instability, and other.

C. NGOs Challenges in Lebanon

NGOs in Lebanon are facing several challenges that are affecting their ability to carry out their work and achieve their goals.

The most impactful challenge local NGOs are facing is the accessibility to consistent, sustainable resources of funding (Bruschini-Chaumet et al., 2019). Many NGOs in Lebanon rely on funding from international donors, but the availability of this funding can be uncertain and inconsistent. This can make it difficult for NGOs to plan and carry out long-term projects, as they are unable to rely on a stable source of funding. In addition to this, NGOs in Lebanon have a lack of coordination and cooperation among different organizations, due to their exponentially growing number and the competitiveness that comes along. With the absence of the state and the increasing number of NGOs operating in the country, it is becoming more and more difficult to coordinate efforts and avoid duplication of work. This can lead to inefficiencies and a lack of impact, despite the growing need for NGO services in Lebanon.

Moreover, with most of the funding being project-based, NGOs often find themselves having very restricted decision-making power over how their budget is being allocated. International donors seem to have more control of the projects being implemented and are very critical when it comes to transparency and accountability, and rightfully so. However, local NGOs do not have enough resources to invest in the

administrative work and provide what the donors are asking for (Bruschini-Chaumet et al., 2019).

Another challenge is the political and security situation in Lebanon. The country has a long history of conflict and instability, and this can make it difficult for NGOs to operate safely and effectively. Moreover, NGOs in Lebanon often face challenges in obtaining the necessary approvals and permits to carry out their work. This can be due to bureaucracy and red tape, as well as the influence of political and financial interests (Internal Governance for NGOs in Lebanon Capacity Building for Poverty Reduction NGO Resource & Support Unit Social Training Center 2 [Reference Book on Internal Governance for NGOs in Lebanon, 2004).

Finally, with the drastic economic situation in Lebanon, the economic crisis is leading to competition over consistent funding and an increase in need, making it more difficult for NGOs to meet the demand of their beneficiaries.

D. People at high risk of food poisoning

According to the CDC, anyone can get food poisoning, but a certain group of people may be at a higher risk than others (People With a Higher Risk of Food Poisoning | Food Safety | CDC, 2019). These people include *Infants and young children* (younger than 5 years); their immune systems are not fully developed yet and they could develop serious complications from food poisoning and sometimes this could lead to hospitalization (*People at Risk: Children Under Five | FoodSafety.Gov*, n.d.). As well as *Pregnant women*, where food poisoning can cause harm to both the mother and the unborn child. Pregnant women should be especially cautious when consuming raw or undercooked meat, raw eggs, and unpasteurized dairy products (*People at Risk:*

Pregnant Women / FoodSafety.Gov, n.d.). *Older Adults* (above 65 years) are also at high risk, with their potential underlying health conditions, more complications could happen during food poisoning. As people age, their immune system weakens, making them more vulnerable to food poisoning (*People at Risk: Older Adults / FoodSafety.Gov, n.d.*). And finally, *People with compromised immune systems*: where certain diseases such as diabetes, liver or kidney disease, HIV/AIDS, or receiving chemotherapy, could increase the risk of food poisoning because they cannot fight germs and sickness as effectively (*People at Risk: Those with Weakened Immune Systems / FoodSafety.Gov, n.d.*).

Other than these categories of people, any individual with underlying health conditions could be at a higher risk of food poisoning. These individuals should take extra precautions when consuming food such as avoiding raw or undercooked eggs and meat and unpasteurized dairy products.

E. Roles of Managers in Implementing Food Safety

Kitchen managers play an essential role in implementing and maintaining food safety in their kitchens. Some of these key responsibilities include, but are not limited to *Developing and imposing food safety policies and regulations*, whereas kitchen managers are responsible for creating a food safety culture that begins by implementing policies that ensure food is handled, prepared, and stored safely (Arendt et al., 2013). Food safety policies could range from guidelines about cooking temperature to cross-contamination prevention and sanitation practices.

Another responsibility includes *Training staff on food safety*, where kitchen managers should ensure that all food handlers are trained on the basics of food safety

and that would be understanding food handling, storage and preparation, cleaning and sanitation, and personal hygiene practices (Arendt et al., 2013). Kitchen staff should be regularly trained either by their managers or by an external party to keep them informed about the new regulations and practices. This will imply the kitchen managers to keep up with the food safety regulations and to stay informed about any changes to the country or federal food safety regulations.

Kitchen managers should also be *Conducting regular food safety inspections and monitoring*; kitchen inspections should be done regularly to ensure that all food safety guidelines and correct practices are being followed (Arendt et al., 2013). Inspections include temperature checks, cleaning checks, food handling, storage conditions, etc. (*Food Safety Management Career, Duties & Certifications*, n.d.)

Kitchen managers should also keep records of food safety measures such as temperature monitoring records, sanitation records, cooking temperature logs, etc. Maintaining records will help to track any issues and identify potential problems (*Recordkeeping — Food Law*, n.d.).

And lastly, *dealing with food safety incidents* is also a critical responsibility that lies on kitchen managers, who should be well prepared to take corrective actions when needed and to address any food safety incidents such as food poisoning complaints or kitchen equipment failures (*Food Safety Management Career, Duties & Certifications*, n.d.).

Kitchen managers should be dedicated to the food safety culture to properly and faithfully implement it inside the kitchen. They must be willing to take the necessary steps to ensure the safety and well-being of their consumers.

F. Studies assessing food safety KAPs of food handlers

Several studies were carried out to assess the food safety knowledge, attitudes, and practices of food handlers. Results of one study done in Lebanon on food handlers in hospitals indicated that food handlers who attended a training course on food safety in hospitals obtained higher knowledge scores (60.8%) than the untrained food handlers (46.2%) (Bou-Mitri et al., 2018).

A similar study done among food handlers in hospitals in Turkey indicated that only 39% of the participants knew that the refrigerator temperature should be 5°C or lower. It also showed that 75% of the staff believed that one could tell whether the food was contaminated with food poisoning bacteria through visual, smell, or taste check (Bas et al., 2016)

Also in Turkey, a study done on food handlers in food businesses showed that the questions answered incorrectly most frequently were related to time-temperature control, cooling, thawing, and hand-washing practices. It also showed a higher score of food safety knowledge in trained food handlers (mean 45.8 ± 17.6) than in untrained food handlers (40.8 ± 14.3) with a general mean of 43.4 ± 16.3 . A great majority reported a positive attitude towards masks, protective clothing, and caps in reducing the risk of food contamination (82.9%) (Baş et al., 2006)

A study that took place in Kuwait studied the KAPs of food handlers in restaurants. A lack of knowledge was reported in aspects related to foodborne pathogens. Only 51.3% knew about *Salmonella* to note that 58% of the participants never attended any food safety course. Resuming this study, 82.3% of the participants were found to have good personal hygiene practices. A significant positive correlation was found between knowledge and ($r_s = 0.536, p < 0.05$) (Al-Kandari et al., 2019)

Another study done in Ghana confirmed that 76.2% of the food handlers did not know that *Salmonella* is a food-borne pathogen. Food safety practices were also highlighted in the study and it showed that 88.1% reported that they do not use gloves during the distribution of unpackaged foods and 83.8% of the food handlers do prepare meals in advance(Akabanda et al., 2017.).

In Portugal, a more focused study on food handlers showed significant differences in the knowledge demonstrated between participants of different levels of education. Participants with higher education levels statistically show a significant difference (higher) compared to those with 4 years ($p=0.012$) or 6 years ($p=0.017$) of formal education in the sources of contamination and high-risk food questions section (Martins et al., 2011.)

G. Study Objectives

The main objective of this study is to: (i) investigate the knowledge, attitudes, and perceptions of the food handlers among Lebanese NGOs through the Kitchen Operational Managers Only; (ii) identify factors, and demographic characteristics, for example, associated with food safety, and (iii) identify areas of improvement, raise awareness and provide recommendations that could be beneficial for kitchen operational managers.

CHAPTER II

METHODOLOGY

A. Study Setting and Population

A descriptive, cross-sectional study was conducted among kitchen operational managers (KOM) in Lebanese NGOs to assess their Knowledge, Attitudes, and Perceptions regarding Food Safety since the KOM could represent the overall KAP of the NGO and the food handlers/volunteers. Chosen NGOs must have a kitchen that cooks meals for the people in need. A list of all potential NGOs with kitchens was obtained from the Lebanese Food Bank. Since the number of NGOs who cook meals is very limited, no sample size calculations occurred. 49 NGOs were chosen to conduct the study. NGOs' approval from the owners or managers was secured before approaching the kitchen operational managers (KOM), conducting the study, and examining their food safety knowledge, attitudes, and perceptions.

B. Recruitment and Data Collection

NGO owners or managers were contacted via email (**Appendix 1**) explaining the purpose of the study and mentioning that the interview will be done with their KOM. The NGO's person in charge shared the contact details of the KOM with the graduate student who was later contacted and presented with the invitation (**Appendix 2**) and the consent form (**Appendix 3**). The KOM was aware that their answers to the survey will not be shared with their NGO. Interviews were later scheduled in-person or

virtually based on the KOM's preference. The AUB research team ensured that the NGO's person in charge, who is not involved in any means in the implementation of the activities or provision of services to beneficiaries, will be recruiting the kitchen operational managers. This would ensure that there is no undue coercion or influence when recruiting participants for the study.

Data Collection was done between September 2022 and November 2022 and was completely anonymous (no NGO or KOM names or any other personal information was recorded). All KOMs were informed that their participation was completely voluntary and that they could stop answering or skip any question at any time during the interview. The interviews were conducted face-to-face or virtually (via zoom or phone calls) with the KOM to better explain and clarify the questions administered. Interviews lasted approximately around 10 to 15 minutes.

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

The data will be kept strictly confidential and stored on the PI's password-protected computer, and only the co-investigator/student will have access, they will be deleted from the password-protected computer 5 years after the end of the study to meet AUB's archive requirements.

C. Study Instrument

The non-self-administered survey (**Appendix 4**) was used to obtain data on (1) sociodemographic characteristics of the managers (e.g., area of residency, educational level, food safety training, etc...) and the NGO (e.g., NGO location, number of

workers/volunteers, meals per day, etc...), and (2) knowledge, attitudes, and perceptions related to food safety. The questionnaire was developed by relying on previous similar studies (Al-Kandari et al., 2019; Baş et al., 2006; Bou-Mitri et al., 2018; Lazou et al., 2012). This study was ethically approved by the institutional review board at the American University of Beirut.

The first section of the survey included socio-demographic characteristics of the KOM such as gender, age, educational level, food safety training reception, years of experience in the food operation field, etc. The first section also included characteristics of the NGO such as the number of meals prepared per day, the number of workers and managers in the NGO, and the NGO's location.

The second, third, and fourth sections of the survey included the knowledge, attitudes, and perception questions, respectively. The knowledge and perception sections consisted of 16 questions/statements, which were grouped into 4 content-discrete subsections

- Personal Hygiene (hand washing, wearing gloves/jewelry/hairnets, etc.)
- Cross Contamination (individuals at risk, contaminated food, vegetable sanitation, etc.)
- Control Measures (Reheating, cooling, thawing, temperatures, etc.)
- Cleaning and Sanitation (wiping towels, detergents, sanitation of machines, etc.)

All items were multiple choice questions or statements with 2-6 possible answer choices including yes/no and agree/disagree statements.

Six attitude questions about food safety were addressed as well to the manager with three choices (1) Agree, (2) Disagree, and (3) Don't Know.

After completion of the surveys, the investigator shared with the manager a fact sheet with information explaining the above-asked questions.

D. Statistical Analysis and Interpretation

Scores for the knowledge, attitudes, and perceptions were developed for the KOM. Regarding the knowledge and perception scores, we summed up the number of correct answers (out of 16) for both scores. Each group's mean was used to dichotomize the participants as having a higher or lower level of knowledge. For instance, the knowledge score for each participant was calculated by coding each correct answer as 1 and incorrect answer as 0, and summing these values such that the highest possible knowledge score was 16. Participants with a score < 9 were considered to have low knowledge levels, whereas those with scores ≥ 10 were considered to have high knowledge. For the attitude scores, every participant's response was computed to the 6 attitude questions by summing up positive attitudes (Agree).

The data obtained were statistically significantly analyzed using the Statistical Package for the Social Sciences (SPSS) version 24.0. Descriptive statistics were presented for the socio-demographics and the knowledge, attitude, and perception scores. Chi-square and Fisher's Exact were used to calculate the associations between the socio-demographics and the Knowledge and Perception Score, separately. Pearson's correlation was used to evaluate the correlation among the food safety knowledge, attitude, and perceptions scores. Simple and multiple linear regression was used to determine the sociodemographic factors (independent variables) that are associated with the knowledge and perception scores. Results from the linear regression models were expressed as beta coefficients (β) with 95% confidence intervals (CI). All reported p-

values were based on two-sided tests and were compared with a significance level of 5%.

CHAPTER III

RESULTS

A. Kitchen Operational Managers and NGO's Characteristics

Kitchen Operational Managers Demographics: The section related to socio-demographics was completed by kitchen managers only. A total of 41 Lebanese managers were interviewed of which 73.2% were female and 26.8% were male. Eight managers refused to participate in the study. 26.8% of the participants were aged between 40 and 49 years old whereas 39% were above 50 years (Figure 1), 41.5% lived in Beirut, 31.70% in Mount Lebanon, and the rest of the participants were divided across Baalback and Bekaa (12.2%), North and Akkar (9.8%) and South (4.90%).

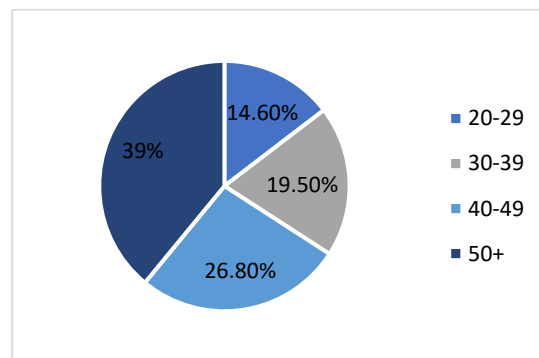


Figure 1-Age Distribution

The majority of the KOM reported that they had a university education (n=30, 73.2%) (Figure 2). Years of service in the food operation are categorized accordingly; 18 out of 41 (43.9%) managers had less than or equal to 5 years of service, 6 (14.6%) served between 6 and 10 years, and 17 served more than 10 years (41.5%).

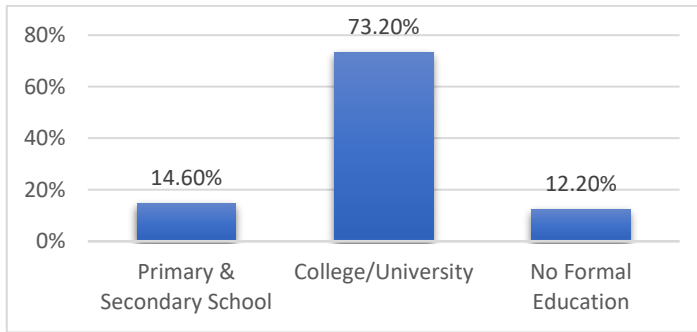


Figure 2-Education Level Distribution

Almost half of the participants (n= 20, 48.8%) never received or attended food safety training, while only 26.8% received training less than 2 years ago or more than 2 years ago (n= 10, 24.4%) (Figure 3). More than 50% of the managers did not conduct medical examinations for the NGO’s food handler (n=24, 58.5%). All the KOMs stated that they apply food safety in their kitchen (n=41, 100%).

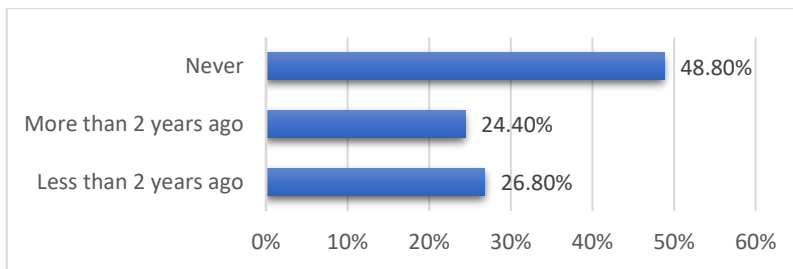


Figure 3-Food Safety Training Reception

NGO’s Characteristics: To understand the size of the NGO, kitchen managers were asked to specify the approximate number of meals served per day as well as the total number of managers and workers. In this study and as referred by Table 1, 41.5% of the managers indicated serving between 101 and 300 meals per day (n=17). As for the number of managers and workers, 78% (n=32) reported having less than or equal to 3 managers, and 43.9% reported having more than 10 workers (between volunteers and food handlers). The majority of the interviewed NGOs were located between Beirut (n=15, 36.6%) and Mount Lebanon (n=14, 34.1%).

Table 1 - Characteristics of the NGOs

Characteristics	Sub-Characteristics	KOM n (%)
Meals per Day	1-100	13 (31.7)
	101-300	17 (41.5)
	More than 300	11(26.8)
Managers in Charge	Less than or equal to 3	32(78)
	More than 3	9(22)
Workers in NGO	Less than or equal to 10	23(56.1)
	More than 10	18(43.9)
Area of Residency	Beirut	15(36.6)
	Mount Lebanon	14(34.1)
	Baalback Hermel /Bekaa	6(14.6)
	North /Akkar	4(9.7)
	South	2(4.9)

B. Food Safety Knowledge

Personal Hygiene: The overall food safety knowledge level of kitchen operational managers was found to be poor at 58% compared to another study where 70.1% was considered satisfactory (Al-Kandari et al., 2019). The score was calculated by summing up the correct answers in the asked questions.

All participants knew that it was important to wash their hands after touching any body part but 26.8% thought that washing their hands with water only would eliminate the bacteria. Findings show that most of the participants (92.7%) knew that it was essential to wear gloves before touching ready-to-eat food. Also, there was good knowledge about the importance of wearing protective clothing during working hours (80.5%).

Cross Contamination and Microbiology: More than half of the respondents (58.5%) claimed that they can tell if the food is contaminated with food poisoning bacteria from the color, the texture (7.3%), or other methods like the taste or the smell (2.4%), only

31.7% knew that the food can taste and smell normal even if contaminated with bacteria. The majority of the managers (80.5%) were unaware that raw or undercooked poultry is associated with *Campylobacter* bacteria, even though this pathogen is a major public health concern in Lebanon and Worldwide (Ibrahim et al., 2019; Lazou et al., 2012).

When the managers were asked what type of food pregnant women, infants and children can eat (Figure 4), 46.3% (n=19) said soft cheeses while 48.8% knew that canned vegetables are the safest option to be consumed by the previously listed people with a high risk of food poisoning.

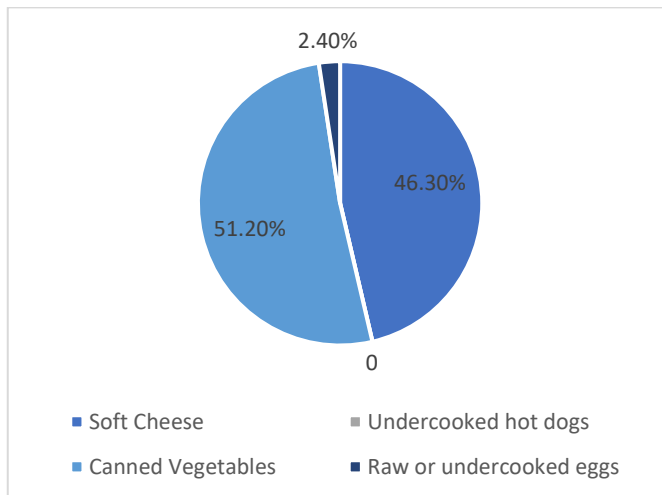


Figure 4-Which foods do pregnant women, infants, and children can have?

A similar question was asked to see whether managers would recognize the least likely people to get food poisoning, the majority (82.9%) answered that teenagers are the ones with a high immune system and are least likely to get food poisoning than other people (Figure 5). All managers knew that cancer patients are at high risk of food poisoning.

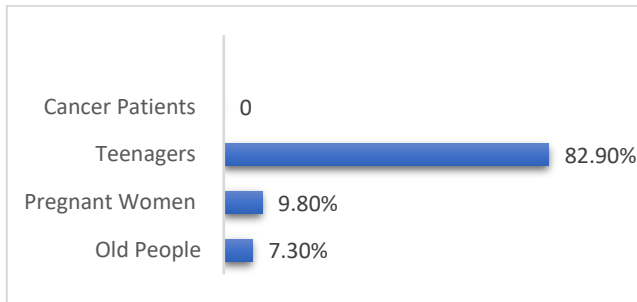


Figure 5- Response for “Least Likely People to Get Food Poisoned”

Control Measures: Control measure questions were asked to assess the knowledge of the managers in taking proper measures when it comes to food safety. Half of the participants in the study (48.8%) said that freezing eliminates bacteria whereas the other half (51.2%) said that freezing does not eliminate the bacteria, which resulted in 53.7% of the managers knowing that -18°C is the temperature of the freezer (Figure 6). However, 75.6% ($n=31$) knew that bacteria grew at a temperature of 25°C which falls within the temperature danger zone (5°C to 63°C) and 24.4% thought that bacteria grew at -10°C .

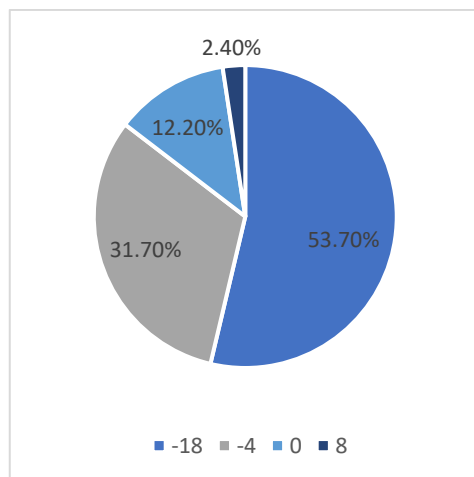


Figure 6-Response for Freezer Temperature

The managers showed low knowledge when it came to the correct method of thawing, only 29.3% ($n=12$) knew that they can use any of the following methods: thaw

food in the fridge overnight, under cold running potable water, and using the microwave. The majority of the managers (56.1%) stated that they thaw the food in the fridge overnight, or under cold running water (14.6%) and none knew that the microwave could be used to thaw food while following the proper measures. Only 34.1% of the managers knew that hot food can be kept only for two hours at room temperature (Figure 7).

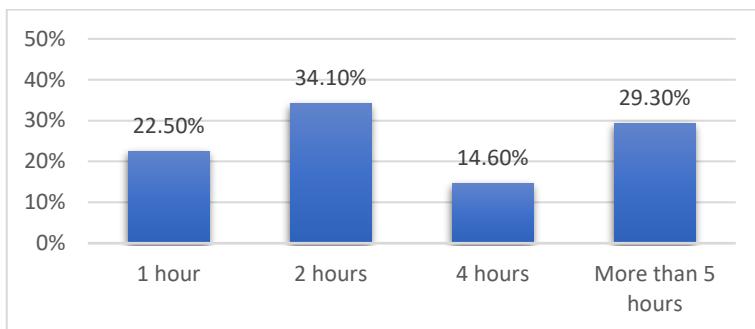


Figure 7-Response for "How Long Can Hot Food Stay at Room Temperature?"

Cleaning and Sanitation: When asked if cotton towels are allowed in the kitchens, 65.9% answered yes while 34.1% answered no. The majority of the managers (65.9%) knew that food processing machines (slicer, grinder, blender...) should be sanitized, and (56.1%) knew the correct way of cleaning food contact surfaces – removing residues, using soap and water, and then using a sanitizer.

C. Food Safety Attitudes

Workers who do have knowledge are more likely to translate them into practices if they have a positive attitude and vice versa (Zanin et al., 2015). In this study and as referred to in Table 2, positive scores for the overall food safety attitudes of kitchen operational managers were noticed. All managers agree that participating in food safety training is essential to enhance their knowledge and food safety practices. They also

agree that knowing the temperature danger zone is essential to reduce food safety risks.

All managers agree that foodborne diseases are a serious issue.

All statements except for two were considered constant during the analysis and thus all attitude variables were not statistically analyzed across the study and will be further discussed.

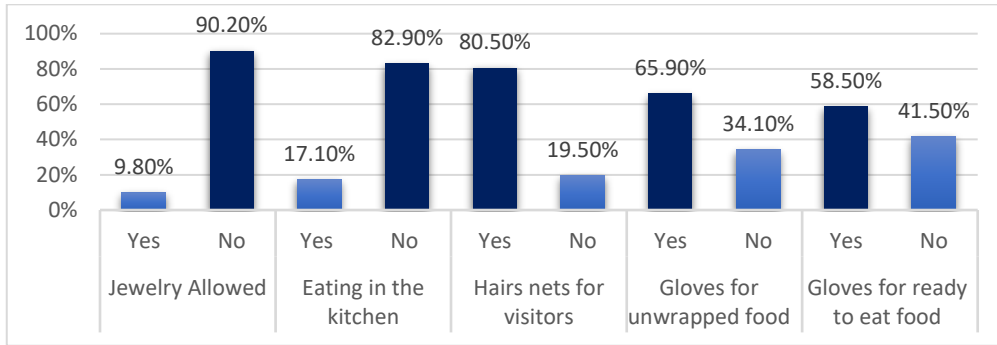
Table 2-Attitudes toward Food Safety of KOM

	Agree	Disagree	Don't Know
I think raw food should be separated from cooked food in the fridge	41 (100)		
Food handlers with cuts on their hands or fingers should not work with food if they are not wearing gloves	38 (92.6)	2(4.8)	1(2.6)
Defrosted foods should not be frozen more than once	40 (97.5)		1(2.5)
I think participating in food safety training is essential to enhance my knowledge and food safety practices	41 (100)		
Knowing the temperature danger zone is essential to reduce food safety risks	41 (100)		
Foodborne diseases are a serious issue	41 (100)		

D. Food Safety Perceptions

Personal Hygiene: As shown in Table 3, managers had a good perception in terms of personal hygiene. The majority of the managers (90.2%) knew that jewelry is not allowed in the kitchen, eating is not allowed in the kitchen (82.9%), and hairnets should be available for visitors (80.5%). Most managers knew that gloves should be worn when handling unwrapped food (65.9%) and ready-to-eat food (58.5%).

Table 3-Personal Hygiene Perceptions of KOM



Cross Contamination and Microbiology: A good part of the managers (70.7%) knew that a different cutting board should be used when dealing with raw meat and ready-to-eat tomatoes (Figure 8).

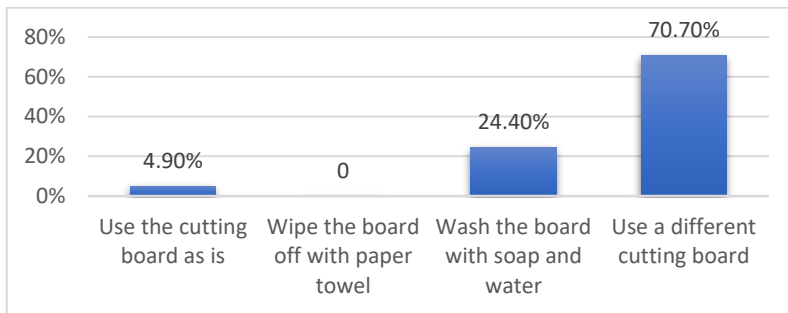


Figure 8-Response for "Usage of Cutting Boards"

However, when asked about the proper way they deal with vegetables before consumption, 61% of the managers said that they rinse them with tap water and they use vinegar and salt. Only 26.8% use sanitizing tablets when cleaning the vegetables for consumption and 12.2% only rinse them with tap water. Furthermore, 56.1% said that they store raw poultry on the lowest shelf of the fridge and 43.9% answered between the middle shelf (31.7%) and above ready-to-eat food (12.2%).

Control Measures: Kitchen managers reported reheating food only once (73.2%), or never reheating the food (14.6%). Most managers stated that food should not be labeled with a production and expiry date (51.2%). When asked about the proper way to cool food before placing it in the fridge, only 26.8% (n=11) said that they place it on the kitchen counter and monitor the time and temperature, 7.3% place it directly in the fridge, and 7.3% said that they place it in the oven. However, 58.5% did not choose any of the previously mentioned options.

A question on late meal pick up was asked to the managers: “If you finished preparing the meals, but the people were late to pick them up, how do you think you should store the meal to keep it safe until the person is ready to eat it?”. The majority of the managers said that they place it in the fridge and then reheat it when it’s time to serve it (56.1%), the rest stated that food is either left on the kitchen counter (22%) or placed in the oven to keep it hot (22%).

Cleaning and Sanitation: Managers showed a good perception of practices when it came to cleaning and sanitation. Equipment and utensils are sanitized between uses (73.2%), wiping towels are soaked in sanitizing solution (34.1%), hand washing sinks are not used for other purposes (78%) and the minimum detergents (soap and sanitizers) are available (92.7%).

E. Association between the knowledge, perception score, and the manager and NGO’s characteristics

Association between the knowledge score and manager’s socio-demographics:

There was no significant association between food safety knowledge score and gender and the years of service in the food operation (Appendix V). Significance was observed

between respondents' food safety knowledge scores and age ($p = 0.005$); respondents aged between 30 and 39 years (19.5%) have significantly higher knowledge scores compared to other age categories. A significant association was noticed between the area of residency and the knowledge score ($p=0.001$), managers living in Beirut had better knowledge than those living in Mount Lebanon. Furthermore, managers who underwent a university education were noticed to have better knowledge than those who did not have a formal education ($p=0.043$). Finally, a significant association was noticed between the knowledge score and the reception of food safety training (0.000); managers who never took food safety training (43.9%) were noticed to have lower knowledge than those who received training less than 2 years ago (26.8%) or more than 2 years ago (19.5%).

Association between the knowledge score and the NGO's Characteristics: There was no significant association between the knowledge score and the number of managers in charge, the number of workers in the NGO, and the location of the NGO. However, a significant association was noticed between the number of meals prepared and the knowledge score of the managers ($p=0.038$); lower knowledge was noticed among managers serving between 1 and 100 meals per day (24.4%).

Association between the Perception score and manager's socio-demographics: There was no significance between the perception score and gender, age, education level, and years of service in the food operation. Similar to the knowledge score, managers living in Beirut had a higher perception score than those living in Mount Lebanon ($p=0.001$). Another important significance was the reception of food safety training, managers who never received food safety training had a lower perception score than those who did ($p=0.000$)

Association between the perception score and the NGO's Characteristics: Similar to the knowledge score, a significant association was noticed between the number of meals prepared and the perception score ($p=0.004$); managers serving between 1 and 100 meals per day (29.3%) showed a lower perception score than those serving between 101 and 300 (19.5%) and more than 300 meals (7.3%). Also, a significant association was noticed between the number of workers in the NGO and the perception score ($p=0.009$); Managers working with more than 10 workers in the NGO (29.3%) showed a higher perception score than those working with less than 10 workers (14.6%). No significant association was noticed between the perception score and the number of managers in charge or the location of the NGO.

F. Relationship Between Food Safety Knowledge, Attitude, & Perception Scores

Pearson Correlation analysis was used to study the association between food safety knowledge, attitudes, and perceptions of KOM (Table 4). Analysis indicated a strong positive significant correlation ($r=0.764$, $p=0.000$) between food safety knowledge and perceptions. A weak positive correlation was noticed between knowledge scores and attitude scores ($r=0.171$) and perception scores and attitude scores ($r=0.273$); however, both were not significant ($p>0.05$).

Table 4-Pearson Correlation (R) Among the Scores Obtained

		Knowledge Score	Attitude Score	Perception Score
Knowledge Score	Pearson Correlation	1	0.171	0.764
	Sig (2-tailed)		0.286	0.000
Attitude Score	Pearson Correlation	0.171	1	0.273
	Sig (2-tailed)	0.286		0.084
Perception Score	Pearson Correlation	0.764	0.273	1
	Sig (2-tailed)	0.000	0.084	

G. Linear Regression Analysis

The Perception Score (Dependent Score) was plotted against Knowledge Score (Independent Variable) and simple linear regression was conducted. Analysis showed that the knowledge score was a statistically significant predictor for perception score ($\beta = 0.706$, $p = 0.000$). The interpretation was for every one unit increase in knowledge score, there will be a 0.706 increase in perception score on food safety among KOM in Lebanese NGOs.

• *Linear Regression of Knowledge score against Manager's Characteristics*

Managers' demographic variables were entered into the regression model, with the knowledge score as the dependent variable.

Simple Linear Regression: Five predictors including age, area of residency, educational level, food safety training reception, and performance of medical examination were statistically significant predictors of knowledge score.

Multiple Linear Regression: Analysis showed that area of residency ((Mount Lebanon ($\beta = -2.706$, $p = 0.002$)), education level ((College/University ($\beta = 1.880$, $p = 0.050$)), and food safety training ((Never Received a Training ($\beta = -4.274$, $p = 0.002$))) remained significantly associated with knowledge score. In this reference, R^2 value= 0.826 shows that the 3 factors (Area of Residency, Education Level, and Food Safety Training Reception) have an 82.6% influence on knowledge.

• *Linear Regression of Perception Score against Manager's Characteristics*

Manager's demographic variables were entered into the regression model, with the perception score as the dependent variable.

Simple Linear Regression: Four predictors including the area of residency, education level, food safety training reception, and performance of medical examination were statistically significant predictors of perception score.

Multiple Linear Regression: Analysis showed that only the area of residency ((Mount Lebanon ($\beta = -2.638$, $p = 0.002$)), and the reception of food safety training ((Never Received a Training ($\beta = -4.343$, $p = 0.000$)) ((Received a Training more than 2 years ago ($\beta = -1.998$, $p = 0.029$)) remained significantly associated with perception score. In this reference, R^2 value = 0.779 shows that the 2 factors (Area of Residency and Food Safety Training Reception) have a 77.9% influence on perception score.

Table 5- Linear Regression of Knowledge Score Against KOM's Characteristics

Predictors	Simple Linear Regression		Multiple Linear Regression	
	β Coefficient, (95% CI)	p-Value	β Coefficient, (95% CI)	p-Value
Gender	-2.082 (-4.686, 0.522)	0.114		
Age				
20-29 (ref.)	0			
30-39	3.750 (0.266, 7.234)	0.036	2.005 (-0.310, 4.320)	0.087
40-49	-1.818 (-5.093, 1.456)	0.268	-1.457 (-3.732, 0.818)	0.200
50+	-1.500 (-4.589, 1.589)	0.331	0.961 (-1.164, 3.087)	0.362
Area of Residency				
Beirut (ref.)	0			
Mount Lebanon	-5.398 (-7.648, -3.148)	0.000	-2.706 (-4.361, -1.051)	0.002

Baalback Hermel – Bekaa	-1.506 (-4.612, 1.601)	0.332	0.811 (-1.562, 3.185)	0.489
North – Akkar	-0.456 (-3.849, 2.938)	0.787	1.165 (-1.209, 3.540)	0.323
South	-2.206 (-6.771, 2.359)	0.334	-2.606 (-5.784, 0.572)	0.104
Education Level				
Primary & Secondary School (ref.)	0			
College/ University	4.000 (0.917, 7.083)	0.012	1.880 (-0.003, 3.763)	0.050
No Education	0.533 (-3.642, 4.708)	0.797	0.402 (-2.219, 3.022)	0.756
Years in Food Service Operation				
Less or equal to 5 years (ref.)	0			
Between 6 and 10 Years	1.167 (-2.444, 4.777)	0.517		
More than 10 years	-0.431 (-3.022, 2.159)	0.738		
Food Safety Training Received				
Less than 2 years ago (ref)	0		0	
More than 2 years ago	-1.673 (-3.696, 0.350)	0.102	-0.759 (-2.848, 1.330)	0.463
Never	-6.573 (-8.311, -4.835)	0.000	-4.274 (-6.772, -1.775)	0.002
Medical examination for the staff	-3.598 (-5.718, -1.478)	0.001	0.865 (-1.018, 2.747)	0.355

• Linear Regression analysis of the knowledge and perception scores with the NGO

Characteristics

Simple and multiple linear regression was studied for the knowledge score against the NGO Characteristics and the perception score against the NGO Characteristics.

Against Knowledge Score: Significant predictors of knowledge score include number of meals served per day, the numbers of workers, and the location of the NGO. Only the location of the NGO remained significantly associated with the knowledge score ($\beta = -2.726$, $p = 0.050$)

Against Perception Score: Similar to the Knowledge score, significant predictors of perception score include number of meals served per day, numbers of workers, and the location of the NGO. Only the location of the NGO remained significantly associated with the perception score ($\beta = -2.597$, $p = 0.036$)

Table 6-Linear Regression of Perception Score Against KOM's Characteristics

Predictors	Simple Linear Regression		Multiple Linear Regression	
	β Coefficient, (95% CI)	<i>p</i> -Value	β Coefficient, (95% CI)	<i>p</i> -Value
Gender	-2.261 (-4.638, 0.117)	0.062		
Age				
20-29 (ref.)	0			
30-39	1.750 (-1.754, 5.254)	0.318		
40-49	-1.364 (-4.657, 1.930)	0.407		
50+	-2.312 (-5.419, 0.794)	0.140		
Area of Residency				
Beirut (ref.)	0			
Mount Lebanon	-5.158 (-7.182, -3.135)	0.000	-2.638 (-4.227, -1.050)	0.002
Baalback Hermel – Bekaa	-2.635 (-5.429, 0.158)	0.064	-1.298 (-3.448, 0.852)	0.227
North – Akkar	-0.485 (-3.537, 2.566)	0.749	-0.142 (-2.298, 2.015)	0.894
South	-3.235 (-7.340, 0.870)	0.119	-1.806 (-4.847, 1.234)	0.235
Education Level				
Primary & Secondary School (ref.)	0		0	
College/ University	3.500 (0.642, 6.358)	0.018	1.252 (-0.579, 3.082)	0.173
No Education	0.100 (-3.770, 3.970)	0.959	-0.312 (-2.795, 2.170)	0.799
Years in Food Service Operation				
Less or equal to 5 years (ref.)	0			
Between 6 and 10 Years	6.08 e-16 (-3.336, 3.336)	1.000		

More than 10 years	-1.029 (-3.422, 1.364)	0.389		
Food Safety Training Received				
Less than 2 years ago (ref)	0			
More than 2 years ago	-2.809 (-4.651, -0.967)	0.004	-1.998 (-3.781, -0.216)	0.029
Never	-6.459 (-8.041, -4.877)	0.000	-4.343 (-6.297, -2.389)	0.000
Medical examination for the staff	-3.694 (-5.584, -1.803)	0.000	-0.417 (-2.094, 1.261)	0.616

CHAPTER IV

DISCUSSION AND RECOMMENDATION

To the best of our knowledge and with a thorough search of the relevant literature, this study is the first study to assess the food safety knowledge, attitudes, and perception of NGOs in Lebanon. The results showed that there are gaps in knowledge and perception scores. The main goal of this study was to examine the factors affecting the knowledge, attitudes, and perception of the managers in the NGOs and to provide the necessary recommendations to be able to help those NGOs in providing safe food for people in need, especially in Lebanon. The study revealed that managers in NGOs require food safety training to be able to serve safe food, noting that a high percentage of the managers never received any kind of food safety training.

It was previously mentioned that the results indicated a positive attitude among the managers regarding food safety. Nevertheless, substantial gaps in their knowledge and perception scores were identified, where the knowledge level influenced their perceptions. No significant correlation was noticed between the attitudes and the knowledge scores of the kitchen operational managers, which could indicate that even though managers have a positive attitude towards food safety and try their best to implement it in their kitchen, their knowledge and practices could be insufficient to implement the correct practices, thus the need for training. Attitude is an essential factor in food handling since it links knowledge and practices; better knowledge could be translated into good and better practices if a positive attitude is present and the other

way around (Zanin et al., 2017). With a positive attitude, managers could be more welcoming of any new recommendations, training, and consultancy programs to ameliorate their food safety knowledge and thus practices.

With a positive attitude of kitchen operational managers, they got low knowledge and perception scores. However, the strong positive correlation between the knowledge score and the perception scores indicated that with better knowledge, better practices could be implemented, thus the need for training enforcement to assist the managers in achieving the target of providing safe food and reducing food poisoning cases. Knowledge by itself is not a main precursor to the provision of safe food, positive attitude is needed as well (Ehiri et al., 1997). In light of this study, a positive attitude has been identified and the focus must be shifted to enhance KOM's knowledge.

Our findings revealed a good knowledge and perception score of personal hygiene among kitchen operational managers. Similar studies showed participants had good knowledge of personal hygiene questions (Abdullah Sani & Siow, 2014; Al-Kandari et al., 2019). However, emphasis on hand washing with soap, and wearing gloves when dealing with unwrapped or ready-to-eat food is necessary. A study done in Turkey showed that a very small percentage of the participants involved in touching or distributing unwrapped food use gloves (Baş et al., 2006). This could indicate a lack of training. According to Codex, lack of hand hygiene is a significant risk factor in the occurrence of contamination and thus foodborne illnesses (Codex Alimentarius Commission, 2003).

One positive finding is that almost more than half of the kitchen operational managers were knowledgeable that old people, pregnant women, and cancer patients were people at high risk of food poisoning. This finding is highly significant for NGOs

since the majority of the people who consume meals from the NGOs are vulnerable and immunocompromised people. However, the majority did not know that immunocompromised people can't consume soft cheeses since it is highly contaminated with bacteria, especially in Lebanon (Joseph Shkair, 2021).

Important gaps were identified when it came to cross-contamination and control measure questions. For example, the majority of the kitchen manager thought that one could recognize if the food was contaminated with food poisoning bacteria through smell or taste only. A similar study showed that also the majority of the participants believed that taste, smell, or visual could help us identify if the food is contaminated and could lead to potential food poisoning case ((Bas et al., 2016). What is of concern here, is the fact that the majority of the NGOs do not use food production and expiry date label (proven in this study), which could help in identifying the validity of the product. Food could taste and smell normal when contaminated with food poisoning bacteria (*Salmonella and Food* / CDC, n.d.) and the expiry date is one way of recognizing whether it is safe to consume the food or not.

Additionally, it was noticed that kitchen operational managers did not know the correct method for thawing and cooling, and the safest method for vegetable sanitation, freezer temperature, and bacterial multiplication temperature. Similar results in other studies were obtained that showed a lack of knowledge in cross-contamination and microbiology among food handlers (Al-Kandari et al., 2019; H. K. Lee et al., 2017). According to a study done in Jordan, the food handlers had the needed knowledge to prevent cross-contamination, however, they were unaware of the procedures to prevent it which can cause a higher risk because they were performing these operations incorrectly (Osaili et al., 2017). According to the WHO, 45.6% of foodborne disease

outbreaks are caused by inappropriate time and temperature control (usually occurring during the thawing or cooling of food), wrong storage, and wrong cooking temperatures (Tirado & Schmidt, 2001). Furthermore, managers were unaware that food processing machines should be thoroughly cleaned and then sanitized using a proper disinfectant or sanitizer, this could be further developed by proper training for the cleaning personnel.

Some conscience regarding the lack of knowledge was noticed by managers during the analysis of the study. In questions where the name of microorganisms are present (*Campylobacter*), the percentage of correct answers was low (19.5%) but the percentage of “do not know” was the highest (65.9%). This could be an indicator that managers are aware of some lack of knowledge and would need proper training to ameliorate their knowledge in this regard.

It is worth noting that the perception of the managers could be different than what is reported since this research is survey-based and no real-life observation was done in the NGO’s kitchens, all answers were self-reported by the managers. No physical test was done on the manager’s hygiene or food contact surfaces like swab tests or sanitizers concentration. In a study done in Malaysia, food handlers had good practice scores, however, microbiological assessment of the food handler’s hands showed high levels of pathogenic bacteria (H. K. Lee et al., 2017).

A significant association between some managers’ characteristics and food safety knowledge and perceptions was noticed in this research. Managers between the age of 30 and 39 years had better knowledge than those in their 50s, however, it was not significant with perceptions. Additionally, higher levels of education were associated with knowledge and not perception. This could be due to the misconceptions of food safety in our Lebanese culture present for years, thus affecting the practice of the

managers regardless of their education levels and knowledge of food safety. This could imply on NGOs to hire managers in the age range that could potentially be more knowledgeable and updated on the latest food safety news and are better educated to spread the correct knowledge and practice among the food handlers. Similar studies showed that the level of education was associated with knowledge scores (Bou-Mitri et al., 2018; Martins et al., 2011.) Most importantly, it was noticed that managers who never took any food safety training showed significantly lower knowledge and perception than those who took training. However, it was noticed that managers who took training less than two years ago showed better knowledge and practices than those who took training more than two years ago. This could be due to the updates in the food industry that should be implemented inside the kitchen to provide safe food. Similar studies showed that participants who had received food safety training had a higher knowledge and practice score than untrained participants (Al-Kandari et al., 2019; Baş et al., 2006; Bou-Mitri et al., 2018). No association was reported between the years of service in the food industry and the knowledge or practice.

NGOs' characteristics also had an impact on knowledge and perception scores; the number of workers in the NGO and the number of meals prepared per day were associated with the perception score. Managers with a higher number of meals prepared per day showed higher perception scores than those who prepare a small batch of meals. This could be due to the bigger sense of responsibility managers feel towards their NGO in providing safe food. This doesn't mean managers working in NGOs providing smaller batches do not feel a sense of responsibility, however, they could have a specific method to prepare the meals within their limited resources. Furthermore, managers working in NGOs having more than 10 workers showed better knowledge

than those working with fewer than 10 workers. This could come from the sense of leadership managers could feel towards their food handlers and thus their will to ameliorate their knowledge and practice in food safety to serve safer food. Thus, food safety training is needed in NGOs to provide safer food. To help managers to start implementing the most important practices, information flyers were distributed as a resource to improve their food safety knowledge and reduce food poisoning cases among people in need. These flyers contained information about proper personnel hygiene, vegetable sanitation, usage of cutting boards, cooking temperature, storage conditions, cleaning procedures, and more.

Multiple Linear Regression analysis showed that managers living in Mount Lebanon have a 2.706 lower knowledge score and 2.638 lower perception score than those living in Beirut. Educational level impacted the knowledge score where managers who went to college or university had higher knowledge scores by 4.000 points than those who went to primary or secondary school. However, education was not a predictor of perception scores.

Results of multiple linear regression analyses also showed that training remained significantly associated with knowledge and perception scores. Never taking food safety training would decrease the knowledge score by 4.274 points and the perception score by 4.343 points. This highlights the need for training to ameliorate the knowledge and perception of managers. Further analysis and controlling of variables showed that taking food safety training less than 2 years ago would increase the knowledge score by 4.274 points. However, taking food safety training more than 2 years ago would still increase the knowledge score, but by 3.515 points. This highlights the need for up-to-date food safety training to keep up with the continuous unpredictable changes in the world that

could affect food safety (Codex Alimentarius Commission, 2013; A Historical Look at Food Safety - IFT.Org, n.d.)

The above results highlight the need for training among the managers to be able to create a food safety culture in their kitchens while using the necessary knowledge. Furthermore, NGOs should hire KOM in the age range that could potentially be more knowledgeable and updated on the latest food safety news and are better educated to spread the correct knowledge and practice among the food handlers. Also, NGOs should emphasize the training of their managers and food handlers to increase their knowledge level and thus their practices. NGOs should also take into consideration the size of the establishment as well as the number of meals prepared. NGOs with a large number of meals prepared and numerous food handlers in the kitchen could require more attention and supervision over the correct practices. And thus, if KOM obtains proper training, they would ensure better supervision of the correct practices.

To emphasize more on the training and how it could be provided properly while keeping the participants interested, it is important to note that lack of interest and commitment, as well as the length of the training session and the language barrier, could be reasons for an unsuccessful training session (Y. M. Lee & Xu, 2015). However, it is highly recommended to study the need of the managers when it comes to delivering training. Training courses should be filled with information relevant to the need of the candidates. In this study, we are studying the need for training for NGOs and not restaurants. NGOs have smaller kitchens than restaurants with food handlers between volunteers and staff. It is necessary to study the need of the NGO to customize specific food safety training that can target the type of food provided by those NGOs i.e., huge quantities of food, hot meals served immediately, and the high turnover of the food

handlers. In addition to the relevance of the information and making sure the training programs provided to the NGO are different than restaurants or hospitals, the location, duration, and use of language need to be considered to allow the food handlers to understand the information (Seaman, 2010). It is important to note that this research is studying the KAP of kitchen operational managers in Lebanese NGOs and thus any results are a reflection of the KAP of food handlers in the kitchen since the managers are the ones in charge of providing the necessary knowledge and tools to the food handlers to prepare and handle the food.

Furthermore, several studies proved that theoretical training associated with practical training i.e., hands-on training or inspection could help the food handlers to retain the information better (Clayton et al., 2002; Niode et al., 2011)

Additionally, training of food handlers should be done periodically to improve the safety of the food and that is by providing meaningful and focused materials for food safety (Dudeja et al., 2017).

This study has limitations, which we can mention: no real-life observations or physical tests were done in the NGOs' kitchens, which could potentially lead to different results than those reported in this study. The difficulty in accessing a full NGO database which may have helped us in getting more samples. Lastly, the study might have a selection bias as participants who were chosen by the NGO's person in charge could already have some knowledge regarding food safety.

CHAPTER IV

CONCLUSION

Kitchen operational managers are the main pillars of an NGO in providing a correct food safety culture. They must be knowledgeable on the basic food safety practices and have a positive attitude to be able to spread it on to the food handlers. Our study has revealed kitchen operational managers are not well knowledgeable about the necessary practices that need to be implemented in the kitchen. However, they have a very positive attitude about applying food safety in the kitchens and this is important since it will allow the kitchen operational managers to be welcoming to any training program or consultancy regarding this topic in their NGOs. In this study, we identified the need for training of kitchen managers that will further impact the knowledge of the food handlers and thus provide necessary food safety training for them too. We encourage first, the private sector and policymakers in Lebanon in addressing the need of NGOs and providing customized and focused training programs, standard operating procedures, inspections, and hands-on activity to help the NGOs with the basics practices to reduce the risk of food poisoning cases. Simultaneously, we encourage several ministries such as the Ministry of Interior, Public Health, Economy and Trade, Tourism, and Industry in considering the NGOs as a critical part of the Lebanese community that is serving food to the people in need and providing it with the necessary governmental resources (permits, checklists, inspectors...)

APPENDIX I

E-mail Invitation to the NGO's person in charge (English)

**This notice is for an AUB-IRB Approved Research Study
for Lynn El Berjawi at AUB
Nutrition and Food Sciences Department
Faculty of Agricultural and Food Sciences
American University of Beirut. P.O. BOX 11-0.236
Riad El Solh 11072020 Beirut, Lebanon.**

It is not an Official Message from AUB

The Department of Nutrition and Food Sciences at the American University of Beirut (AUB) invites your school to participate in research project entitled "Food Safety Knowledge, attitudes and Perception of NGO's in Lebanon: a cross sectional study".

This research project is part of the thesis of a food safety graduate student at AUB, and under the supervision of Dr. Samer Kharroubi, an assistant professor in the Department of Nutrition and Food Sciences at AUB.

The purpose of this research project is to examine the perceptions and knowledge of NGO's in Lebanon providing cooked meals to people in need. In addition, kitchen operational managers will be interviewed to examine the food safety knowledge, attitudes and perceptions. Findings from this study will be later analyzed to help the NGO's in preparing, handling and serving safe food to people in need. NGO's are providing cooked meals to vulnerable people like elderly, kids and pregnant women who are at high risk of food poisoning and thus ensuring a safe preparation of the meals is essential and necessary. This study will help us identify the needs of NGO's in general when it comes to food safety.

Your NGO will be one of forty-nine NGO that will be recruited as sites to conduct this research study.

Below is a summary of what the research project will entail:

1. To avoid undue influence on participants, you are kindly asked to share with us the contact details of the kitchen operational manager or the head chef (if no operational manager available). The graduate student from AUB will then contact the kitchen operational manager and will share with him/her the consent form to take his/her approval on the participation in the study

2. After obtaining the kitchen operational manager's approval on the participation in the study, the graduate student will agree on a private setting and timing with the kitchen operational manager to conduct the interview. The latter will be held either in person or virtually depending on the COVID-19 restrictions and preference of the kitchen operational manager.
3. The kitchen operational manager will then receive a small informative flyer containing food safety basic tips that could be applied inside their kitchen in order to ameliorate the food safety practices at the NGO and provide safer food to the people.

Participation of the kitchen operational manager is completely on voluntary basis and data confidentiality and privacy will be respected and secured as part of the research protocol.

If your NGO is interested to participate in this research, we would like to schedule an online meeting with you at your earliest convenience for further information.

Looking forward to hearing from you, Sincerely

APPENDIX II

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 “Food safety Knowledge, Attitudes and Perceptions (KAPs) among NGOs in Lebanon: a cross-sectional study.”

You will be asked to complete a short survey/questionnaire with demographic information

You are invited because we are targeting kitchen operational managers who are responsible of the NGOs kitchen and food handling of cooked meals

The estimated time to complete this survey is approximately 10-15 minutes

The research is conducted via a meeting with the kitchen operational managers, to be agreed on via a phone call

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 (Lynn El Berjawi, 70733449, lse12@mail.aub.edu)

APPENDIX III

CONSENT FORM

Dear Participant,

You are invited to participate in a research study entitled “Food Safety Knowledge, Attitudes and Perceptions (KAPs) among NGOs in Lebanon: a cross-sectional study.” 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 investigate the knowledge, attitudes, and perceptions of the Lebanese NGOs on food safety.

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 49 NGOs in different Lebanese districts providing cooked meals to vulnerable people
- Completing the questionnaire will take around 10-15 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

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, studying the knowledge, attitudes, and perceptions of the Lebanese NGOs will provide us with valuable insight into how well-informed this population is.

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 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

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 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, we can schedule a meeting for the interview.

APPENDIX IV

Food Safety Knowledge, Attitudes and Perceptions (KAPs) among NGOs in Lebanon: a cross-sectional study

Survey

Principle Investigator: Dr. Samer Kharroubi

Student: Lynn El Berjawi

A) Socio-demographic

1. Gender
 - a. Male
 - b. Female
 - c. Other

2. Age group
 - a. 20-29
 - b. 30-39
 - c. 30-49
 - d. 50+

3. Nationality: _____

4. Area of residency:
 - a. Beirut
 - b. Mount Lebanon
 - c. Baalback Hermel
 - d. North
 - e. Akkar
 - f. Bekaa

5. Educational Level
 - a. Primary school
 - b. Secondary school
 - c. College/ University

- d. No formal education
- 6. Number of years' staff in the foodservice operation
 - a. >1 years
 - b. 1-5 years
 - c. 6-10 years
 - d. < 10 years
- 7. Food Safety training attendance
 - a. < 2 years ago
 - b. > 2 years ago
 - c. Never
- 8. Do you apply food safety practices in the kitchen?
 - a. Yes
 - b. No
- 9. Medical examination card from the Ministry of Health
 - a. Yes
 - b. No

Characteristics of the NGO

- 10. Number of meals served per day
 - a. 1 – 100
 - b. 101- 300
 - c. > 300
- 11. Number of managers in charge
 - a. <3
 - b. ≥ 3
- 12. Number of workers'/food handlers/volunteers other than the manager
 - a. < 10
 - b. >10
- 13. NGO's location:
 - a. Beirut
 - b. Mount Lebanon
 - c. Baalback Hermel
 - d. North
 - e. Akkar

f. Bekaa

B) Food Safety Knowledge

Personal Hygiene Knowledge

1. Is it essential to wash hands after touching any part of your body?
 - a. Yes
 - b. No

2. Is it essential to wear gloves before touching ready-to-eat food?
 - a. Yes
 - b. No

3. Hand washing before handling food, using only water, reduce the risk of contamination?
 - a. Yes
 - b. No

4. Is it essential to wear protective clothing when working in the kitchen?
 - a. Yes
 - b. No

Cross Contamination and microbiological Knowledge

5. Food contaminated with food poisoning bacteria, will:
 - a. Taste and smell normal
 - b. Have a slight change in color
 - c. Be slimy
 - d. None of the above

6. *Campylobacter* bacteria are most likely associated with which food?
 - a. Canned food
 - b. Raw or undercooked poultry
 - c. Raw or undercooked beef
 - d. Don't know

7. Which foods do pregnant women, infants, and children can have?
 - a. Soft cheeses
 - b. Undercooked hot dogs
 - c. Canned vegetables
 - d. Raw or undercooked eggs

8. Which of these individuals is LEAST likely to get food poisoning?
 - a. Old people
 - b. Pregnant women
 - c. Teenagers
 - d. Cancer patients

Control Measures Knowledge

9. Freezing eliminates harmful bacteria in food
 - a. Yes
 - b. No

10. What is the recommended temperature for freezers?
 - a. -18°C
 - b. -4°C
 - c. 0°C
 - d. 8°C

11. Which of the following temperature do bacteria readily multiply at?
 - a. -10°C
 - b. 25°C
 - c. 75°C
 - d. 120°C

12. What is the correct method for thawing frozen food?
 - a. Leave it in the fridge overnight until its thawed
 - b. Under cold running water
 - c. In the microwave
 - d. All of the above

13. How long can hot food stay at room temperature (between 5 and 63°C)
 - a. 1 hour
 - b. 2 hours
 - c. 4 hours
 - d. More than 5 hours

Cleaning and sanitation Knowledge

14. Cotton towels are allowed in the food preparation area
 - a. Yes
 - b. No

15. Which of the following is the proper way to clean food-contact surfaces?
 - a. Water only
 - b. Water then sanitizer
 - c. Remove residues, clean with soap then water, use a sanitizer
 - d. None of the above

16. Food processing machines (slicer, meat grinder, mixer, etc...) and cutting boards should be sanitized after their use?
 - a. Yes
 - b. No

C) Food Safety attitudes

1. I think raw food should be separated from cooked food in the fridge
 - a. Agree
 - b. Disagree
 - c. Don't know

2. Food handlers with cuts on their hands or fingers should not work with food if they are not wearing gloves
 - a. Agree
 - b. Disagree
 - c. Don't know

3. Defrosted foods should not be frozen more than once
 - a. Agree
 - b. Disagree
 - c. Don't know

4. I think participating in food safety training is essential to enhance my knowledge and food safety practices
 - a. Agree
 - b. Disagree
 - c. Don't know

5. Knowing the temperature danger zone is essential to reduce food safety risks
 - a. Agree
 - b. Disagree
 - c. Don't know

6. Foodborne diseases are a serious issue
 - a. Agree
 - b. Disagree
 - c. Don't know

D) Food Safety Perceptions

Personal Hygiene Perceptions

1. Is jewelry allowed in the kitchen?
 - a. Yes
 - b. No

2. Is eating allowed in the kitchen?
 - a. Yes
 - b. No

3. Should hair nets be available at the kitchen for visitors and staff?
 - a. Yes
 - b. No

4. Should you wear gloves when you touch or distribute unwrapped food?
 - a. Yes
 - b. No

5. Should you wear gloves when handling ready-to-eat food (i.e. Working with vegetables)?
 - a. Yes
 - b. No

Cross Contamination and Microbiological Perceptions

6. After using a cutting board for raw meat and you want to cut tomatoes, what do you think is the best practice to do?
 - a. You use the board as is
 - b. You wipe the board off with a paper towel
 - c. You wash the board with soap and water
 - d. You use a different cutting board

7. How should vegetables be treated before consumption?
 - a. Rinse them with tap water
 - b. Rinse them with tap water and use vinegar/salt
 - c. Rinse them with tap water and use sanitizing tablets
 - d. No rinsing

8. Where should you store raw poultry inside the fridge?
 - a. Lowest shelf
 - b. Middle shelf
 - c. Above ready to eat food
 - d. Near cleaned vegetables

Control Measures Perceptions

9. How many times could leftovers be reheated?
 - a. One time
 - b. Two times
 - c. Three-time
 - d. Never

10. Should you label food properly with a production and expiry date?
 - a. Yes
 - b. No

11. What do you think is the correct method to cool food?
 - a. On the kitchen table with time and temperature monitoring (60°C to 21°C in 2 hours; 21°C to 5°C in 4 additional hours)
 - b. Inside the fridge
 - c. In the oven
 - d. None of the above

12. If you finished preparing the meals, but the people were late to pick them up, how do you think you should store the meal to keep it safe until the person is ready to eat it?
 - a. Store it on the kitchen counter
 - b. Store it in the oven
 - c. Store it in in open air to cool
 - d. Store it in the refrigerator and reheat before consumption

Cleaning and Sanitation Perceptions

13. Should equipment and utensils be sanitized between uses?
 - a. Yes
 - b. No

14. Should wiping towels be soaked in sanitizing solutions?
- a. Yes
 - b. No
15. Do you think you can use handwashing sinks for other purposes?
- a. Yes
 - b. No
16. Do you think minimum detergents (soap and sanitizers) should be available in the kitchen?
- a. Yes
 - b. No

APPENDIX V

Association between the Knowledge Score and Socio-demographics

Characteristics	Sub-Characteristics	Knowledge Score		Chi-square or Fisher's exact value
		Low	High	
Gender	Male	7.3% (3)	19.5% (8)	0.095
	Female	41.5% (17)	31.7% (13)	
	Total	48.8% (20)	51.2% (21)	
Age	20-29	4.9% (2)	9.8% (4)	0.005
	30-39	0	19.5% (8)	
	30-49	17.1% (7)	9.8% (4)	
	50+	26.8% (11)	12.2% (5)	
	Total	48.8% (20)	51.2% (21)	
Nationality	Lebanese			
Area of Residency	Beirut	9.8% (4)	31.7% (13)	0.001
	Mount Lebanon	29.3% (12)	2.4% (1)	
	Baalback Hermel - Beqaa	4.9% (2)	7.7% (3)	
	North – Akkar	2.4% (1)	7.7% (3)	
	South	2.4% (1)	2.4% (1)	
	Total	48.8% (20)	51.2% (21)	
Education Level	Secondary School	12.2% (5)	2.4% (1)	0.043
	College/University	26.8% (11)	46.3% (19)	
	No Formal Education	9.8% (4)	2.4% (1)	
	Total	48.8% (20)	51.2% (21)	
Years of Service in the food operation	1-5 years	19.5% (8)	24.4% (10)	0.546
	6 and 10 years	7.3% (3)	7.3% (3)	
	More than 10 years	22% (9)	19.5% (8)	
	Total	48.8% (20)	51.2% (21)	
Food Safety Training	Less than 2 years ago	0%	26.8% (11)	0.000
	More than 2 years ago	4.9% (2)	19.5% (8)	
	Never	43.9% (18)	4.9% (2)	
	Total	48.8% (20)	51.2% (21)	
Medical Examination for your staff	Yes	9.8% (4)	31.7% (13)	0.011
	No	39% (16)	19.5% (8)	
	Total	48.8% (19)	51.2% (21)	
Apply food Safety	Yes			

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