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Knowledge, Attitude and Practices of Lebanese Married Women towards Food Safety.

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ABSTRACT

Objectives: To determine the knowledge, attitude, and practices of Lebanese married women toward food safety and to assess the correlation of these factors with socio-demographic characteristics.

Methods: The evaluation forms of the "Five Keys to Safer Food Manual" of the WHO (World Health Organization) were administered to 516 Lebanese married women living in Beirut and Mount Lebanon between December 2017 and May 2018. The questionnaire is divided into three sections: food safety knowledge (11 questions), attitude (10 questions), and practices (10 questions). A score was calculated for each section with one point for every correct answer.

Findings: The mean of knowledge score was 8.23 ± 1.59 over 11, the attitude score was 7.43 ± 1.82 over 10, and the behavior score was 6.69 ± 2.32 over 10. The relationship between the knowledge score and other scores was weak (with behavior score r = 0.222 and attitude score r = 0.260; p-value <0.005). Knowledge and attitude scores were higher than practices score. Food safety knowledge, attitude and practices did not differ with age nor the number of kids. Years of marriage and employment only influenced practices. Frequency of cooking influenced knowledge and behavior. The main food safety problems were found in separating raw from cooked food, cooking food to the right temperature and keeping food at safe temperature whether hot-holding or thawing.

Conclusions: Knowledge of food safety measures might not reflect good food safety practices. Therefore, there is a need to highlight the importance of safe practices and prevention of foodborne illnesses.

KEYWORDS

Food Safety; Knowledge; Attitude, Practices; Married Women; Lebanon.

1. INTRODUCTION

Safe and nutritious food is necessary to advocate a good and healthy living. Unsafe food can cause number of diseases mainly affecting infants, young children, elderly and ill people. Food Safety is "the assurance/guarantee that food will not cause harm to the consumers when it is prepared and/or eaten according to its intended use". According to WHO, almost 1/10 people (600 million) get ill from consuming contaminated food in the world, of whom 420 000 people die every year. Children under 5 years of age carry 40% of the foodborne disease load, with 125 000 deaths every year [1].

Diarrheal diseases are the most common results of contaminated food consumption. They are the cause of illness of 550 million and death of 230 000 people every year. Foodborne illnesses cases caused by home prepared food are underestimated. Almost 87% of reported foodborne illness outbreaks can be linked to food prepared at home. In the US and Europe, 15% and 33% respectively of the reported foodborne illness outbreaks are estimated to be caused by food prepared at home [2].

The five keys to food safety according to WHO are: keeping clean, separating raw and cooked food, cooking thoroughly, keeping food at safe temperature, and using safe water and raw materials [1]. The objective of the study was to determine the knowledge, attitude, and practices of Lebanese married women aged from 20 to 60 years old and living in Beirut and Mount Lebanon toward food safety and their association with sociodemographic characteristics.

2. METHODS

2.1. Population

A total of 516 married Lebanese women from 20 to 60 years of age living in Beirut and Mount Lebanon were chosen as a convenient sample since we had access to these two governorates.

2.2. Data Collection

The study data was collected by 2 investigators. The women were recruited in large shopping centers, supermarkets, hospitals gardens and public areas.

2.3. Instruments

The evaluation forms of the "Five Keys to Safer Food Manual" of the WHO were used. These forms contain 3 chapters and 31 questions [3] that were translated by a translator to Arabic language. The original questionnaire was divided into three sections: food safety knowledge (11 questions), food safety attitude (10 questions), and food safety practices (10 questions). Then 10 socio-demographic questions were added (age, governorate, district, region, number of kids, years of marriage, education,

bachelor's degree, employment, frequency of cooking). Hard copy questionnaires were used and they were self-administered.

2.4. Statistical Analysis

Statistical analyses were performed using SPSS software (statistical package for the social science, version 23.0). Qualitative variables were reported using frequencies and percentages. Quantitative variables were summarized as means and standard deviations. $P < 0.05$ was considered as statistically significant. Internal consistency was calculated using Cronbach's alpha. A score was given for each section of the questionnaire, one point for every correct answer. The comparison of scores with the socio-demographic characteristics were done using One-Way ANOVA and Pearson Correlation. Food safety knowledge score, attitude score and practices score were assessed using Pearson Correlation.

3. RESULTS

Five hundred sixteen questionnaire forms were filled by Lebanese married women between December 2017 and May 2018. The average age of the participants was 41.59 ± 11.39 years. Concerning years of marriage categories, 23.6% of respondent have been married for 1 to 5 years, 27.7% for 6 to 15 years, 20% for 16 to 25 years, 20% for 26 to 35 years, and 8.7% for 36 to 45 years. 4.1% of the participants were pregnant. Regarding education, 16.5% of the married women attained middle school, 23.8% high school and 54.7% completed a university degree. Thirty-nine percent of the respondents were full-time workers (39%), 14.9% were part-time workers, others were unemployed (42.6%), and 3.5% were students. A total of 68% always cooked meals at home, 15.3% sometimes did it, 13.8% not often did it, and 2.9% never cooked at home (Table 1).

Table 1. Socio-demographic of Participants

	Frequency	**Percentage (%)**
Governorates		
Beirut	103	20
Mount Lebanon	413	80
Districts		
Beirut	103	20
Baabda	86	16.7
Maten	87	16.9
Chouf	51	9.9
Aley	70	13.6
Keserwan	49	9.3
Jbeil	70	13.6

Age		
20 to 30 years	111	21.5
31 to 40 years	130	25.2
41 to 50 years	130	25.2
51 to 60 years	145	28.1
Kids		
No kids	75	14.5
Pregnant	21	4.1
1 kid younger than 1 year	23	4.5
1 kid older than 1 year	43	8.3
2 kids or more	354	68.6
Education		
Middle School	85	16.5
High School	123	23.8
University	282	54.7
Other	26	5
Bachelor's degree		
Medicine/Paramedical	39	13.4
Engineering	22	7.6
Law	22	7.6
Radio & TV	12	4.1
Arts	22	7.6
Other	174	59.8
Employment		
Full-time worker	201	39
Part-time worker	77	14.9
Full-time homemaker/ unemployed	220	42.6
Student	18	3.5
Cooking Frequency		
Always	351	68
Sometimes	79	15.3
Not often	71	13.8
Never	15	2.9

The mean of knowledge score was 8.23 ± 1.59 over 11. Regarding the first key of food safety (Keep Clean), 99.6% of respondents thought that washing hands before handling food was important, 89.3% believed that wiping cloths could spread microorganisms. Regarding separating raw and cooked food, 73.6% reported that the same cutting board cannot be used for raw and cooked foods even if it looks clean and 90.3% thought that raw and cooked foods should be stored separately. Only 35.5% thought that meat cooked to 40˚C is properly cooked and 61.3% believed that cooked foods need to be thoroughly reheated. Less than half of the respondents (42.4%) believed that cooked meat cannot be left at room temperature overnight to cool, 67.8% reported that food should be kept very hot before serving, 75% believed that refrigerating food only slows bacterial growth. Regarding the use of safe

water and raw materials, only 35.7% reported that safe water can be identified by the way it looks and 95.2% believed that fruits and vegetables should be washed. (Table 2).

Table 2. Food Safety Knowledge among Participants

Knowledge	True	False
Key 1 – Keep clean		
1a. It is important to wash hands before handling food.	514 (99.6%)*	2 (0.4%)
1b. Wiping cloths can spread microorganisms.	461 (89.3%)*	55 (10.7%)
Key 2 – Separate raw and cooked		
2a. The same cutting board can be used for raw and cooked foods provided it looks clean.	136 (26.4%)	380 (73.6%)*
2b. Raw food needs to be stored separately from cooked food.	466 (90.3%)*	50 (9.7%)
Key 3 – Cook thoroughly		
3a. Cooked foods do not need to be thoroughly reheated.	197 (38.2%)	319 (61.8%)*
3b. Proper cooking includes meat cooked to 40 °C.	183 (35.5%)	333 (64.5%)*
Key 4 – Keep food at safe temperatures		
4a. Cooked meat can be left at room temperature overnight to cool before refrigerating.	297 (57.6%)	219 (42.4%)*
4b. Cooked food should be kept very hot before serving.	350 (67.8%)*	166 (32.2%)
4c. Refrigerating food only slows bacterial growth.	387 (75%)*	387 (75%)
Key 5 – Use safe water and raw materials		
5a. Safe water can be identified by the way it looks.	184 (35.7%)	332 (64.3%)*
5b. Wash fruit and vegetables.	491 (95.2%)*	25 (4.8%)

**Correct Answer*

The mean of attitude score was 7.43 ± 1.82 over 10. About 55.2% of married women agreed that frequent hand-washing during food preparation was worth the extra time. Half of the participants (50.4%) agreed that using different knives and cutting boards for raw and cooked foods was worth the extra effort. Using meat thermometers to ensure that food is cooked thoroughly was supported by 40.7% of the respondents. Regarding inspecting food for freshness and wholesomeness, 90.7% agreed about its importance. Additionally, 96.7% agreed to throw away foods that have reached their expiry date. (Table 3).

Table 3. Food Safety Attitude among Participants

Attitude	Agree	Not Sure	Disagree
Key 1 – Keep clean			
1a. Frequent hand-washing during food preparation is worth the extra time.	285 (55.2%)	70 (13.6%)	161 (31.2%)
1b. Keeping kitchen surfaces clean reduces the risk of illness.	497 (96.3%)	14 (2.7%)	5 (1%)
Key 2 – Separate raw and cooked			
2a. Keeping raw and cooked food separate helps to prevent illness.	421 (81.6%)	83 (16.1%)	12 (2.3%)
2b.Using different knives and cutting boards for raw and cooked foods is worth the extra effort.	260 (50.4%)	47 (9.1%)	209 (40.5%)

Key 3 – Cook thoroughly			
3a. Meat thermometers are useful for ensuring food is cooked thoroughly.	210 (40.7%)	175 (33.9%)	131 (25.4%)
3b. Soups and stews should always be boiled to ensure safety.	411 (79.7%)	72 (14%)	33 (6.4%)
Key 4 – Keep food at safe temperatures			
4a. Thawing food in a cool place is safer.	413 (80%)	77 (14.9%)	26 (5%)
4b. I think it is unsafe to leave cooked food out of the refrigerator for more than two hours.	364 (70.5%)	89 (17.2%)	63 (12.2%)
Key 5 – Use safe water and raw materials			
5a. Inspecting food for freshness and wholesomeness is valuable.	468 (90.7%)	29 (5.6%)	19 (3.7%)
5b. I think it is important to throw away foods that have reached their expiry date.	499 (96.7%)	9 (1.7%)	8 (1.6%)

The mean of behavior score was 6.69 ± 2.32 over 10. About 84.1% reported always washing their hands before and during food preparation, 66.7% reported always separating utensils and cutting-boards when preparing raw and cooked food. Less than half of the respondents (43.2%) reported always checking that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer and 12.2% reported never checking it, 45.9% reported always reheating cooked food until it is piping hot throughout and 42.2% reported always thawing frozen food in the refrigerator or other cool place. Half of the respondents (51.7%) reported always storing any left-over food in a cool place within two hours. (Table 4).

Table 4. Food Safety Behavior among Participants

Practices	Always	Most Times	Sometimes	Not Often	Never
Key 1 – Keep clean					
1a. I wash my hands before and during food preparation.	434 (84.1%)	74 (14.3%)	6 (1.2%)	2 (0.4%)	0 (0%)
1b. I clean surfaces and equipment used for food preparation before re-using on other food.	410 (79.5%)	83 (16.1%)	21 (4.1%)	2 (0.4%)	0 (0%)
Key 2 – Separate raw and cooked					
2a. I use separate utensils and cutting-boards when preparing raw and cooked food.	344 (66.7%)	90 (17.4%)	54 (10.5%)	16 (3.1%)	12 (2.3%)
2b. I separate raw and cooked food during storage.	372 (72.1%)	69 (13.4%)	58 (11.2%)	12 (2.3%)	5 (1%)
Key 3 – Cook thoroughly					
3a. I check that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer	223 (43.2%)	98 (19%)	70 (13.6%)	62 (12%)	63 (12.2%)
3b. I reheat cooked food until it is piping hot throughout.	237 (45.9%)	157 (30.4%)	71 (13.8%)	36 (7%)	15 (2.9%)

Key 4 – Keep food at safe temperatures					
4a. I thaw frozen food in the refrigerator or other cool place.	218 (42.2%)	156 (30.2%)	82 (15.9%)	32 (6.2%)	28 (5.4%)
4b. After I have cooked a meal I store any left-overs in a cool place within two hours	267 (51.7%)	121 (23.4%)	95 (18.4%)	27 (5.2%)	6 (1.2%)
Key 5 – Use safe water and raw materials					
5a. I check and throw away food beyond its expiry date.	479 (92.8%)	34 (6.6%)	1 (0.2%)	2 (0.4%)	0 (0%)
5b. I wash fruit and vegetables with safe water before eating them.	476 (92.2%)	30 (5.8%)	8 (1.6%)	0 (0%)	2 (0.4%)

Cronbach's alpha for the 31 items of the questionnaire was 0.611, which indicated low reliability. The coefficient increased to 0.703 when the following knowledge questions were deleted: 1b, 2a, 2b, 3a, 4a, 4b, 4c and 5a.

There was a weak relationship between the knowledge score and other scores: $r = 0.222$ with behavior score and $r = 0.260$ with attitude score ($p < 0.005$). The relationship between the attitude score and behavior score was moderate ($r = 0.477$, $p < 0.005$).

The attitude score was significantly different between the two governorates ($p < 0.005$). The mean of Beirut 6.6 ± 1.96 was lower than that the mean of Mount Lebanon 7.64 ± 1.73. The behavior score was significantly different between the two governorates ($p < 0.001$). The score of Beirut (5.47 ± 2.77) was lower than the score of Mount Lebanon (7 ± 2.09). Concerning districts and attitude score, there was a significant difference between the scores of each district ($p < 0.001$). The greatest mean of attitude score was for Jbeil (7.84 ± 1.89) and the lowest was for Beirut (6.6 ± 1.96). For the behavior score there was also a significant difference between the scores of each district ($p < 0.001$). The highest behavior score mean was for Maten (7.44 ± 1.82) and the lowest was for Beirut (5.47 ± 2.77).

There was no significant correlation between age and knowledge score ($p = 0.879$), nor attitude score ($p = 0.466$) nor behavior score ($p = 0.280$). There was a positive significant but weak correlation between the behavior scores and the years of marriage ($r = 0.111$, $p = 0.012$). There was no significant correlation between number of kids and knowledge score ($p = 0.362$), nor attitude score ($p = 0.405$) nor behavior score ($p = 0.34$).

Regarding the food safety knowledge, there was a significant difference between university level and high school level ($P=0.009$) and between university level and others ($P=0.029$). Concerning education level and attitude score, there was also a significant difference between education levels and

the attitude score (p = 0.047). The highest mean was for middle school level (7.61 ± 1.934) and the lowest for other (6.81 ± 2.13).

Regarding bachelor's degree and knowledge score, there was a significant difference (p = 0.027), with the highest mean in those who studied Medicine/Paramedical (8.85 ± 1.80 over 11).

Concerning the employment, the lowest behavior score was for part-time workers (6.05 ± 2.57) and the highest one was for those unemployed (6.93 ± 2.38), with p = 0.026.

Regarding cooking and knowledge score, there was a significant difference (p = 0.033) between participants who never cooked (9 ± 1.81) and those who did not cook often (7.77 ± 1.35). Also in the behavior score, the difference was significant (p = 0.015), with the highest mean in those who never cooked (7.13 ± 2.66) and the lowest in those who did not cook often (5.92 ± 2.32).

4. DISCUSSION

In our study, the food safety knowledge score among participants was 8.23 ± 1.59 over 11 (74.81%). Although different questionnaires were used, some studies found similar knowledge levels. Meysenburg et al. reported a food safety knowledge level of 73% [4]. In Sanlier study, a sample of Turkish adults scored 80.1% on knowledge [5]. However, other studies showed insufficient knowledge levels [6]. Female students in a Lebanese University had a lower level of food safety knowledge (54.4%) [7].

The practices score was above average (6.69 ± 2.32 over 10). In comparison, practices level among Lebanese females in Hassan study [7] was below average (46.4%). Additionally, in the sample of Turkish adults, they scored below average on food safety practices (30.47%) [5]. There was a moderate but significant correlation between knowledge and practices scores. Similar results were demonstrated in Hassan study [7]. Therefore, consumers' food safety knowledge influenced their food handling practices [8]. Although participants had a good food safety knowledge, safe practices were limited. Behavior score was lower than knowledge score, as in previous studies [2,7–10].

There was no significant relationship between age and food safety knowledge. The same results were obtained concerning attitude and practices scores, even though age is considered one of the most important factors influencing food safety behavior [8]. In a study conducted in Turkey [5], they found that adult consumers, who had similar age range as our participants (20 to 66 years old), had significantly better knowledge and practices than the young participants.

The pregnant women scored the lowest on food safety practices (5.90 ± 2.87 over 10). Similar to Trepka et al. who showed that women having their first pregnancy had the lowest practices score

[11]. However, in our study, the difference of practices scores between pregnant women and other women was not significant. Regarding years of marriage, women who had been married for 36 years or more scored the highest on practices (7.27 ± 2.10 over 10). These results show that food practices are safer in those women that are married for more years. This may be attributed to experience in food preparation. Education level had an influence on the knowledge score ($p = 0.002$). The respondents who graduated from university were more knowledgeable about food safety (8.43 ± 1.59 over 11) than high school graduates (7.89 ± 1.64 over 11), with $p = 0.009$.

Participants with bachelor's degree in Medicine/Paramedical have higher knowledge score (8.85 ± 1.80 over 11) than participants from other fields. This result may be due to food safety and microbiology courses studies by the participants. Analogous results were found by a number of studies [7,12–14].

Working hours only influenced the food safety behavior ($p = 0.026$). Unemployed married women scored the highest on food safety practices (6.93 ± 2.38 over 10). However, the difference was only significant with part-time workers ($p = 0.023$). A study showed that increasing working hours reduced time devoted to food preparation [15]. Therefore, working women have less time to spend on food preparation and focusing on food safety where more mistakes may occur.

The knowledge score was significantly higher in married women who never cooked (9 ± 1.81 over 11) than in those who cooked less frequently. Similar results were found in a study conducted on a Lebanese University students, where those who always cooked scored lower than those who never cooked [7]. However, concerning practices, married women who always cooked have significantly better food safety behavior than married women who rarely cooked. Married women may have gained these safe practices through experience.

The respondents were knowledgeable on how to separate cooked and raw food. A total of 73.6% reported that the same cutting board cannot be used for raw and cooked foods even if it looks clean, while a 50.4% agreed about the importance of using different knives and cutting boards for raw and cooked foods. However, in practice, only 66.7% reported always separating utensils and cutting-boards when preparing raw and cooked food.

Married women show a low knowledge level regarding food storage and proper temperatures. Less than half of the participants (42.4%) reported that cooked meat cannot be left at room temperature overnight to cool, only 67.8% reported that food should be kept very hot before serving, and only 75% believed that refrigerating food only slows bacterial growth. Eighty percent believed that thawing food in a cool place is safer, similar to Hassan study where 28% declared that they defrost frozen meat or chicken in the refrigerator [7]. Moreover, 58.4% reported that thawing is an acceptable method, but

21% declared thawing at the counter and 20.6% at the sink [16]. In addition, 62.7% reported defrosting frozen food at room temperature. In another study, 7.2% of the participants reported thawing food in the refrigerator [6].

Furthermore our study indicated that 70.5% believed that it is unsafe to leave cooked food out of the refrigerator for more than two hours. Although 80% believed that thawing food in a cool place is safer, only 42.2% always thaw frozen food in the refrigerator or other cool place.

Regardless the percentage of respondents (70.5%) who reported that it is unsafe to leave cooked food out of the refrigerator for more than two hours, only 51.7% always store any left-over food in a cool place within two hours. In the study of Langiano et al., only 28% stored food in the refrigerator within 24 hours if not eaten [6].

Food safety information should be communicated to the consumers in order to explain the importance of food safety, the severity of foodborne diseases and how to prevent them. Brochures could be distributed at the supermarkets or through media campaigns because it tackles a larger number of people. In addition, food safety courses should be included in the curriculum of schools to emphasize students' perception toward food safety. However, as demonstrated, knowledge of food safety measures might not reflect good food safety practices. Therefore, there is a need for educational food safety programs that focus on the importance of adopting safe food handling practices. Last but not least, further studies should be conducted to assess the knowledge, attitude and practices of all Lebanese population toward food safety.

Because the population of the study consisted of married women aged between 20 and 60 years old living in Beirut and Mount Lebanon, the results cannot be generalized to all Lebanese women of all ages. Moreover, practices were self-reported and no actual practices were observed which may be prone to bias.

5. CONCLUSIONS

In conclusion, the results confirm that the household represents a key site for microorganisms responsible for foodborne illnesses. Knowledge and attitude scores were higher than practices score. Food safety knowledge, attitude and practices did not differ with age nor number of kids. Years of marriage and employment only influenced practices. Frequency of cooking influenced knowledge and behavior. The main food safety problems were found in separating raw from cooked food, cooking food to the right temperature and keeping food at safe temperature whether hot-holding or thawing. Therefore, there is a need for educational food safety programs focused on the importance of adopting

safe food handling practices and for further studies assessing the knowledge, attitude and practices of all Lebanese population toward food safety.

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AUTHOR CONTRIBUTIONS

RH and NY contributed in conceiving and designing the analysis, collecting the data, performing the analysis and writing the paper. MAH contributed in conceiving and designing the analysis and reviewing the paper. MH contributed in reviewing the paper.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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