

## Food Safety: A Study of Jordanian Consumer's Knowledge and Practices

<sup>1</sup>Nizar Issa Alrabadi, <sup>2</sup>Motasem AL-Massad and <sup>1</sup>Omar Alboqai

<sup>1</sup>Department of Food Science and Nutrition,  
Faculty of Agriculture, University of Jerash, Jordan

<sup>2</sup>Department of Animal Production, Faculty of Agriculture, Jarash University

---

**Abstract:** This study investigated the Jordanian consumers' knowledge and self-reported practices of safe food handling. A questionnaire based on a five-point Likert scale was distributed on 300 randomly selected consumers. The answers of 208 respondents were analyzed. The results showed that Jordanian consumers follow some safety rules when they prepare or purchase food products while they lack awareness of some others. Additionally, statistically significant differences in purchasing behavior and safe food handling were found between males and female and between respondents of different ages and income levels. Finally, a microbial analysis of samples of the traditional dish in Jordan (Mansaf) collected from several houses indicated low bacterial counts. Thus, food hygiene knowledge and attitudes of Jordanian households who prepare food were satisfactory.

**Key words:** Food Safety • Purchasing Behavior • Jordanian Consumer • Safe Handling • knowledge  
• Practices • Microbial Count

---

### INTRODUCTION

Food safety is an international concern. Considerable proportion of foodborne diseases is owing to unsafe food-handling practices. WHO [1] reported that these diseases were found to affect more than 30% of the population in developed countries. The problem is expected to be even more severe in developing countries. Thus, enhancing the consumer knowledge of safety rules would minimize pathogenic microorganisms in food. Great academic interest has been given to investigate the knowledge and self reported practices of food safety overall the world [2]. Researchers found different results. People were found to know major rules specifically hygiene issues and there were a lack of understanding to many important ones [3]. Consumers in many societies seemed to be unfamiliar with the ideal refrigeration temperature [2, 4-8]. Large numbers of consumers did not use a thermometer during food preparation [5, 7, 9]. Most consumers lack awareness of the different classes of bacteria and especially the pathogenic ones [2, 9]. On the other hand, most respondents in different studies recognized that hand washing is a necessary food safety practice [2, 6, 9-11].

The studies that examined the effect of demographic characteristics on consumer's food safety knowledge and practices generally found that they were more likely to increase with age, the level of education and experience in food preparation [12-14]. Moreover, females were found to be more familiar with safe food-handling procedures than males [8, 15-19]. Older adults showed better knowledge of food safety rules than younger adults respondents [20, 21].

Studies of food safety knowledge and practices are few in Jordan. To the best of authors' knowledge, this is the first study that directly tackles this issue in Jordan. The remaining of the study is organized as follows: Section 2 describes data and methodology. Section 3 reports the results. Section 4 discusses them. Section 5 concludes.

### MATERIALS AND METHODS

The study used a questionnaire divided into three sections, the first asked about the demographic characteristics of the respondents. The second explored the purchasing behavior of food products while the third examined the consumer knowledge of safety rules of

food handling at home. Responses were measured by means of a five-point Likert scale. 300 questionnaires were distributed for randomly selected Jordanian consumers. 208 were received back, thus the response rate was 69.3%. SPSS was used to analyze the data. Given that this data was not normally distributed, Kruskal-Wallis and van der Waerden non-parametric statistical tests [22] were used to investigate the differences in purchasing behavior and safe food handling knowledge and practices between respondents with different demographic characteristics. The two tests were estimated via E-Views 5. Moreover, samples of the traditional dish in Jordan (Mansaf) were taken from different houses. Mansaf is made of lamb or chicken cooked in a sauce of fermented dried yogurt (called Jameed) and served with plain rice. The microbial count of each sample was then estimated using different media, each to detect certain type of bacteria. The total bacterial counts were enumerated on (NA) nutrient agar (Difco); plates were incubated for 48h at 32°C. For counting the total enterococci spp., BEA (bile esculin agar) medium (Difco) was used; plates were incubated at 37°C for 48h. For counting the total coliform bacteria, the VRBA (violet red bile agar) medium (Difco) was used as recommended by [23]; plates were incubated at 37°C for 48h. The Baird-Parker agar BPA [24] medium (Difco) were used to enumerate the total staphylococci; plates were incubated at 37°C for 48h. Nutrient agar was used for detecting spore forming bacteria as described by [25]; the plates were incubated for 72h at 32°C.

## RESULTS

Table 1 summarizes the demographic characteristics of the respondents. 69% of them were females. More than half of the respondents were between 29 and 49 years old. Nearly all of them were educated and more than half of them could be considered from the middle income class, specifically, 28% of them with an income of JD 250-500 and 29% with an income of JD 501-750. 73% of the respondents were married so that they were households.

Table 2 reports the results of the survey. Section 1 shows the answers with respect to the purchasing behavior of the respondents. 68% of them always check the expiration date before purchasing the food products. 32% always check the food package before purchase and 43% do so frequently. Moreover, most of the respondents make sure that the food can is not buckling or bulging either always or frequently. More than half of

Table 1: The demographic characteristics of respondents.

Demographic Characteristics		Percentage %
Gender	Male	31
	Female	69
Marital Status	Single	27
	Married	73
Age	18-28	11
	29-39	32
	40-49	31
	50-59	14
	Above 60	12
Education	Not Educated	3
	School	12
	Graduate Diploma	9
	Bachelor	41
	Postgraduate Diploma	8
	Master	22
Income	PhD	14
	Less than JD 250	12
	250-500	28
	501-750	29
	751-1000	18
	Above 1000	13

the respondents pay attention to the cleanliness of the store they purchase their food from, 26% always do that and 34% do it frequently. Similarly, 34% of the respondents always make sure that the product is free of pigments and 31% do so frequently. The respondents pay attention to the trade mark or the producer of the food product, 39% always do so and 42% do it frequently. 84% of the respondents always or frequently put frozen foods in the freezer immediately on reaching home. Most of the respondents check the calories contained in the food product if not frequently, some times. However, Jordanian consumers do not follow some of the food safety rules. For example, 27% of the respondents rarely check if the food product is free of preservatives and 10% do not check at all. Approximately half of the respondents rarely or never check the cooling temperature of the frozen food. 37% of the respondents rarely pay attention to the nutritional value of the product and 19% never do so. Not all of them check the ingredients of the product or compare between the packaging materials of it. 37% rarely follow the storage instructions printed on the product and 10% do not do so at all.

Section 2 of Table 2 summarizes the answers of the respondents with regard to the safety rules of handling food at home. Most of them care about the general hygiene rules of preparing food. 41% of the respondents always check the cleanliness of the surfaces where they prepare food and 37% do so frequently. Nearly all of

Table 2: The purchasing behavior and safe food handling practices of respondents.

Section 1: Purchasing behavior	Always	Frequently	Sometimes	Rarely	Never
You check the expiration date before purchasing food products	68	25	4	2	1
You check for buckling or bulging food cans	34	46	13	5	2
You check food packages if they have been opened or damaged	32	43	18	4	3
You check cooling temperature for frozen food	12	14	22	31	21
You follow storage instructions printed on the food products	13	18	27	37	10
You follow preparation instructions printed on some products	22	35	38	4	1
You make sure that the product is free of preservatives	14	16	33	27	10
You make sure that the product is free of industrial pigments	34	31	27	3	5
You put frozen foods in the freezer immediately on reaching home	44	40	10	6	0
You give attention to the ingredients of the product you purchase	17	13	36	23	11
You give attention to the amount of calories the product contains	23	28	30	12	7
You pay attention to the cleanliness of the store you purchase your food from.	26	34	31	7	2
You compare the quality of the package of the food products	16	20	26	23	15
You pay attention to the nutritional value of the product	11	16	17	37	19
You pay attention to the trade mark or the producer of the product	39	42	17	2	0
Section 2: Safe Handling	Always	Frequently	Sometimes	Rarely	Never
You check the cleanliness of the surfaces where you prepare food	41	37	21	0	1
You clean your hands before preparing any food	52	45	3	0	0
You wear gloves in case of having wounds when you prepare food	0	24	36	28	12
You wear respirator in case of being sick when you prepare food	3	5	16	65	11
You place leftover foods in the refrigerator in no later than two hours of consumption	21	38	31	8	2
You use a thermometer when you prepare food	2	5	3	18	72
You store raw and cooked foods separately in the refrigerator.	21	19	27	17	16
You suffered from food born diseases	2	17	36	35	10
You use raw foods such as eggs, meat and milk in your food	0	0	18	24	58
You concern about the classes of bacteria which cause diseases	1	0	9	13	77
You leave cooked food at room temperature until cool before placing it in the refrigerator	62	26	2	6	4
You freeze thawed food again	8	10	19	51	12
You consider the freshness of ingredients when you prepare food	32	37	28	3	0
You pay attention to the smell and color of food before using it.	38	42	14	4	2
You use microwave in preparing food.	13	22	40	16	9

them always or frequently wash their hands before preparing any food. 32% always consider the freshness of ingredients when they prepare food and 37% frequently do so. 80% of the respondents always or frequently pay attention to the smell and color of food before using it. 62% of the respondents always leave cooked food at room temperature until cool before placing it in the refrigerator and 26% do so frequently. Moreover, more than half of the respondents always or frequently place leftover foods in the refrigerator in no later than two hours of consumption. 24% of the respondents rarely use raw foods such as eggs, meat and milk in food and 58% never do so. 63% rarely or never freeze thawed food again. However, the respondents do not follow all the food handling safety rules. For instance, 65% rarely wear respirator in case of being sick when they prepare food and 11% never wear it. Only 24% frequently wear gloves in case of having wounds and no respondents always do so. 72% of the respondents never use a thermometer in food preparation and 18% rarely use it. 77% of the respondents never concern about the classes of

bacteria which cause diseases. This may be explained by the fact that consumers do not have a background about the classification of microorganism and which of them are pathogenic and thus cause foodborne diseases. Finally, there is no consensus in the answers of the respondents of using microwave. 35% always or frequently use it while 25% rarely or never use it, the rest use it sometimes.

Table 3 reports the results of Kruskal-Wallis and van der Waerden nonparametric tests. Both tests show a statistically significant difference between males and females with respect to their purchasing behavior and safe food handling. There is no significant difference between single and married respondents with regard to purchasing behavior, however, married respondents seems to be more aware of safe food handling than singles. Both tests show no effect of education level on our results. On the other hand, the purchasing behavior and safe food handling of respondents increases as both age and income increase. In fact, both tests show statistically significant difference between different classes of both age and income.

Table 3: Statistical tests of differences in respondents' purchasing behavior and safe food handling according to demographic characteristics.

	Purchasing behavior		Safe handling	
	van der Waerden	Kruskal-Wallis	van der Waerden	Kruskal-Wallis
Gender	6.5423*	7.2314*	5.9876*	6.0987*
Marital status	1.0765	1.1024	4.0451*	4.1876*
Age	14.2799*	10.26804*	15.2365*	13.7621*
Education	4.1287	4.9876	3.4678	4.4432
Income	14.4781*	16.0363*	12.8712*	14.1063*

\*Denotes significance at a p-value equals 5%.

Table 4: Bacterial counts of Mansaf samples

Medium	Bacterial counts (CFU/g)				
	NA	VRBA	BPA	NA	BEA
Group target	Total bacterial count	Total coliform	<i>Staphylococcus spp.</i>	Spore former bacteria	<i>Enterococcus spp.</i>
Samples					
1	1.2×10 <sup>1</sup>	ND	ND	ND	ND
2	ND	ND	ND	3.1×10 <sup>1</sup>	ND
3	2.9×10 <sup>3</sup>	5.2×10 <sup>1</sup>	3.2×10 <sup>2</sup>	1.8×10 <sup>1</sup>	ND
4	7.3×10 <sup>1</sup>	ND	ND	1.1×10 <sup>2</sup>	1.3×10 <sup>1</sup>
5	ND	ND	ND	ND	ND
6	1.7×10 <sup>2</sup>	1.0×10 <sup>1</sup>	ND	2.4×10 <sup>1</sup>	2.8×10 <sup>1</sup>
7	2.1×10 <sup>3</sup>	1.5×10 <sup>2</sup>	1.2×10 <sup>1</sup>	3.3×10 <sup>1</sup>	2.1×10 <sup>1</sup>

Table 4 reports the microbial count of seven different samples of Mansaf collected from different houses. The results generally show low numbers of bacteria in all samples. This could be due to the high temperature treatment during food preparation. The total bacterial count in the seven samples ranged from zero to 2.9×10<sup>3</sup>. Sample number 5 was free of any bacteria, indicating that food handlers in this house strictly follow safety and hygiene rules during and after preparing their food. *Staphylococcus spp.* was detected in two samples. This class of bacteria is a part of the normal micro flora of the skin of humans [26]. Total coliform and *Enterococcus spp.* were found in three samples. The existence of these different classes of bacteria may refer to contaminated practices of food handlers such as unclean cooking tools or dirty hands. Only two samples were free of spore former bacteria. This type of bacteria resists high temperature. It perhaps exists in the raw components of Mansaf. Overall, these counts of bacteria do not cause serious foodborne diseases. Thus, we rarely hear about poisoning cases for people eating home prepared food.

### DISCUSSION

Our survey findings indicated that Jordanian consumers were aware of food safety rules, although there were also many gaps in their knowledge and

practices that might lead to foodborne illnesses. For most consumers, there was a correct adherence to food hygiene food preparation conditions. However, the findings showed low levels of awareness among them with respect to pathogenic bacteria and optimal heating/cooling temperatures. This is consistent with the findings of [3, 27-30]. Consumer purchasing behavior is another factor impacting foodborne illnesses. Jordanian consumers seemed to follow safety rules when they purchase their food products, specifically, most of them pay attention to the expiration dates, packaging, cleanness of the store, calories and pigments included and the trade mark of the producer. On the other hand, they do not concern about the nutritional value of the product, the existence of preservatives and its ingredients. These findings are compatible with those of [3, 28] for Turkish consumers. Our statistical analysis signified that older, married and higher income respondents were more familiar with food safety rules. Similarly females were better than males in safety food handling. This is in agreement with [3, 31].

Previous studies found that home setting is considered as the first place in which foodborne diseases develop as a result of poor personal and environmental hygiene with an increased danger of contamination [2, 32-35]. Accordingly, we conducted a microbial analysis of the traditional dish in Jordan (Mansaf) in several

houses. Our findings showed low bacterial counts, indicating that home-prepared food in Jordan is to some extent safe. Thus, Jordanian households seemed to follow safety rules while cooking. Annor and Baiden [26] conducted similar microbial analysis; however, for food samples prepared in different hotels in Ghana and found contrasting results. Their findings indicated high microbial counts ranging from  $1.2 \times 10^5$  to  $1.1 \times 10^8$  CFU/g.

### CONCLUSION

Safety food handling practices and purchasing behavior of 208 Jordanian consumers were analyzed. A survey of their knowledge and attitudes showed the following results, most respondents check expiration dates, packaging, the cleanness of the store the trade mark or the producer, the existence of pigments and the amount of calories when they purchase their food products. Though, only few of them consider the existence of preservatives, the nutritional value, the cooling temperature for the frozen food, the ingredients and the material of the package. The results were also divergent with regard to food handling practices at home. Overall hygiene food preparation conditions were followed such as clean hands and cooking surfaces. In addition, most consumers were found to pay attention to the freshness of the ingredients, make sure not to use raw food such as eggs or milk and keep the leftovers no more than two hours out of the refrigerator. However, respondents were unaware of many safe food handling rules. Only few of them wear gloves and respirators when needed. Nearly all of them do not use thermometer while cooking and most importantly almost all of them were unconscious with the microorganisms and the classes of bacteria that cause foodborne diseases. A further statistical analysis using two non parametric tests showed that females, older and higher income respondents were significantly more sentient of safe food handling practices and purchasing behavior than their counterparts. Finally, as home being the main place where food is prepared, we conducted a microbial analysis of samples of the traditional dish in Jordan (Mansaf) in several houses. The results showed that the maximum total bacterial count in all samples was  $2.9 \times 10^3$ . *Staphylococcus spp*, total coliform, *Enterococcus spp* and spore former bacteria were detected in some samples but in low counts. Accordingly, Jordanian households appear to adopt good hygiene practices in the home setting when preparing food.

### REFERENCES

1. WHO (World Health Organization), 2010. Retrieved from <http://www.who.int/mediacentre/factsheets/fs237/en/print.html>.
2. Redmond, E.C. and C.J. Griffith, 2003. Consumer food handling in the home: a review of food safety studies. *Journal of Food Protection*, 66(1): 130-161.
3. Aygen, F.G., 2012. Safe Food Handling: Knowledge, Perceptions and Self-Reported Practices of Turkish Consumers, *International Journal of Business and Management*, 7(24): 1-11.
4. Worsfold, D. and C. Griffith, 1997. Food safety behavior in the home. *British Food Journal*, 99(3): 97-104.
5. Cody, M.M. and M.A. Hogue, 2003. Results of the home food safety- It is in your hands 2002 survey: Comparisons to the 1999 benchmark survey and healthy people 2010 food safety behaviors objective. *Journal of the American Dietetic Association*, 103: 1115-1125.
6. Knight, P.G., J.C. Jackson, B. Bain and D. Eldemire-Shearer, 2003. Household food safety awareness of selected urban consumers in Jamaica. *International Journal of Food Sciences and Nutrition*, 54(4): 309-320.
7. Badrie, N., A. Gobin, S. Dookeran and R. Duncan, 2006. Consumer awareness and perception to food safety hazards in Trinidad, West Indies. *Food Control*, 17(5): 370-377.
8. Jevšnik, M., V. Hlebec and P. Raspor, 2008. Consumers' awareness of food safety from shopping to eating. *Food Control*, 19: 737-745.
9. Food and Drug Administration FDA. 2006. FDA/FSIS food safety survey topline frequency report. Retrieved from <http://www.fda.gov/Food/ScienceResearch/>
10. McCarthy, M., M. Brennan, A. L. Kelly, C. Ritson, M. De Boer and N. Thompson, 2007. Who is at risk and what do they know? Segmenting a population on their food safety knowledge. *Food Quality and Preference*, 18(2): 205-217.
11. Odwin, R. and N. Badrie, 2008. Consumers' perceptions and awareness of food safety practices in Barbados and Trinidad, West Indies – a pilot study. *International Journal of Consumer Studies*, 32: 394-398.
12. Bruhn, C.M. and H.G. Schutz, 1999. Consumer food safety knowledge and practices. *Journal of Food Safety*, 19(1): 73-87.

13. Roseman, M. and J. Kurzynske, 2006. Food safety perceptions and behaviors of Kentucky consumers. *Journal of Food Protection*, 69: 1412-1421.
14. Van Kleef, E., L.J. Frewer, G.M. Chryssochoidis, J.R. Houghton, S. Korzen-Bohr, T. Krystallis, J. Lassen, U. Pfenning and G. Rowe, 2006. Perceptions of food risk management among key stakeholders: Results from a cross-European study. *Appetite*, 47: 46-63.
15. Albrecht, J.A., 1995. Food safety knowledge and practices of consumers in the U.S.A. *Journal of Consumer Study & Home Economics*, 19: 119-134.
16. Altekruze, S.F., D.A. Street, S.B. Fein and A.S. Levy, 1996. Consumer knowledge of foodborne microbial hazards and food-handling practices. *Journal of Food Protection*, 59: 287-294.
17. Altekruze, S.F., S. Yang, T.B. Babagaleh and F. Angulo, 1999. A multi-state survey of consumer food-handling and food-consumption practices. *American Journal of Preventive Medicine*, 16(3): 216-221.
18. Meer, R.R. and S.L. Misner, 2000. Food safety knowledge and behavior of expanded food and nutrition education program participants in Arizona. *Journal of Food Protection*, 63: 1725-1731.
19. Li-Cohen, A.E. and C.M. Bruhn, 2002. Safety of consumer handling of fresh produce from the time of purchase to the plate: a comprehensive consumer survey. *Journal of Food Protection*, 65(8): 1287-1296.
20. Angelillo, I.F., M.R. Foresta, C. Scozzafava and M. Pavia, 2001. Consumers and foodborne diseases: knowledge, attitudes and reported behavior in one region of Italy. *International Journal of Food Microbiology*, 64: 161-166.
21. Rimal, A., S.M. Fletcher, K.H. McWatters, S.K. Misra and S. Deodhar, 2001. Perception of food safety and changes in food consumption habits: A consumer analysis. *Journal of Consumer Study and Home Economics*, 25: 43-52.
22. Conover, W.J., 1980. *Practical Nonparametric Statistics*, 2nd edition, New York: John Wiley & Sons.
23. Standard method for the examination of dairy products microbiological and chemical, 1960. *American Public Health and Professional*, pp: 263-307.
24. Baird-Parker, A.C., 1962. An improved diagnostic and selective medium for isolating coagulase-positive staphylococci. *J. Appl. Bacteriol.*, 25: 12-19.
25. Difco's Manual, 1984. *Manual of Dehydrated Culture and Reagents for Microbiology* Detroit, Michigan, Michigan, USA.
26. Annor, G.A. and E.A. Baiden, 2011. Evaluation of Food Hygiene Knowledge Attitudes and Practices of Food Handlers in Food Businesses in Accra, Ghana. *Food and Nutrition Sciences*, 2: 830-836.
27. Unusan, N., 2007. Consumer food safety knowledge and practices in the home in Turkey. *Food Control*, 18: 45-51.
28. Cagri-Mehmetoglu, A., 2009. Public perception of food handling practices and food safety in Turkey, *Journal of Food, Agriculture and Environment*, 7(2): 113-116.
29. Conter, M., L. Pojani, C. Cortimiglia, P. Di Ciccio, S. Ghidini, E. Zanardi and A. Ianieri, 2009. Domestic food handling practices and food safety, *Ann. Fac. Medic. Vet. di Parma*, XXIX: 33-38.
30. Sanlier, N., A. Dağdeviren, B. Çelik, S. Bilici and A. Abubakirova, 2011. Determining the knowledge of food safety and purchasing behavior of the consumers living in Turkey and Kazakhstan, *African Journal of Microbiology Research*, 5(18): 2724-2732.
31. Anderson, A.L., L.A. Verrill and N.R. Sahyoun, 2011. Food Safety Perceptions and Practices of Older Adults, *Public Health Reports*, 126: 220-227.
32. Griffith, C., D. Worsfold and R. Mitchell, 1998. Food preparation, risk communication and the consumer. *Food Control*, 9: 225-232.
33. Kagan, L.J., A. Aiello and E. Larson, 2002. The role of the home environment in the transmission of infectious diseases. *J Community Health*, 27: 247-267.
34. Scott, E., 2001. Developing a rational approach to hygiene in the domestic setting. *J. Infect*, 43: 45-49.
35. Langiano, E., M. Ferrara, L. Lanni, V. Viscardi, A.M. Abbatecola and E. De Vito, 2012. Food safety at home: knowledge and practices of consumers, *Journal of Public Health*, 20: 47-57.