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Article

Food Safety Knowledge, Attitudes, and Practices (KAP) Among Dairy Retail Vendors in Amman, Jordan

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Abstract: Food safety in dairy shops has gained increasing attention. Consequently, this study aims to evaluate dairy handlers' knowledge of food safety practices, assess compliance with food safety codes regarding facility maintenance and personal hygiene, and understand retail dairy shops' capacity to implement food safety standards. This research involved surveys and interviews with 110 dairy retail workers to gauge their grasp of food safety principles, their recognition of its importance, and the obstacles they encounter in implementing proper food safety measures. Among the participants, 93% were males under 35 years old, with experience ranging from 1 to 8 years. The study revealed that while over 83% of participants were familiar with standard procedures ensuring dairy product safety, only 37% understood "HACCP" in relation to food safety. Additionally, 42% believed that freezing food at -18°C eliminates food bacteria, and 56% thought food contamination could be identified by taste, indicating misconceptions among respondents. Results showed that 90% of survey participants had a strong awareness of food safety, with 98% emphasizing the importance of regular inspection of production areas for cleanliness to ensure a safe dairy production environment. However, less than 45% had received formal training on dairy-specific food safety practices, and only 53.6% had a documented system for correctly labeling and providing production dates for dairy products. These findings have significant implications for public health and food safety policies in Jordan. Furthermore, the study provides valuable insights to enhance food safety practices among dairy retail vendors.

Keywords: food safety; knowledge; attitudes; practices; dairy retail vendors

1. Introduction

Ensuring the safety of dairy sold in retail establishments is crucial for public health and has implications for consumer well-being and economic stability (Grout et al., 2020). In Jordan, where dairy consumption is significant and increasing, it is essential to understand and address the factors affecting the safety of retail dairy sale shops. Given the high and rising dairy consumption in Jordan, identifying points of contamination in the food chain and preventing cross-contamination in subsequent stages are imperative due to the public health risks (Pakdel et al., 2023).

The safety evaluation of retail dairy sale shops in Jordan is influenced by various global factors including international standards, technological advancements, global food safety trends, and the exchange of best practices among nations. Organizations like the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the Codex Alimentarius Commission set global food safety standards that shape regulations and practices in individual countries (Jay, 2019). Advancements in food processing technologies, transportation, and packaging also significantly impact the safety and quality of dairy products sold in retail settings (Rejeesh and Anto 2023).

In Jordan, the safety of retail dairy is governed by comprehensive national standards and regulations developed and enforced by entities like the Jordan Food and Drug Administration (JFDA)

and the Jordan Institution for Standards and Metrology (JISM), aligned with international guidelines (Jordan Food and Drug Administration, 2020; Jordan Institution for Standards and Metrology, 2018). Proper hygiene management and policies to ensure food safety are crucial for public health and consumer confidence (Lee et al., 2010). The implementation of Hazard Analysis and Critical Control Points (HACCP) is essential to ensuring food safety in retail dairy sale shops worldwide, including in Jordan, where HACCP principles are incorporated into regulatory frameworks (Cusato et al., 2012).

The practices observed in Jordanian dairy retail shops are keys to determining the safety and quality of dairy sold in retail establishments. These practices, including animal handling, environmental factors, and storage conditions adhere to national standards but face challenges such as inadequate infrastructure and limited resources (Ledo, et al., 2021). To address rising food safety issues, governments worldwide are enhancing food safety efforts through facility modernization and staff training. Dairy handlers require education on food safety protocols to produce safe and healthy dairy products (Ruegg, 2003). Therefore, this study aims to assess dairy handlers' knowledge of food safety practices, evaluate compliance with food safety codes in facility maintenance and personal hygiene, and understand the ability of retail dairy sale shops to implement food safety conditions.

2. Materials and Methods

2.1. Design of the Study

The present study is a cross-sectional survey approach to evaluate the sanitary and hygiene conditions in retail dairy outlets across Jordan. Interviews were carried out covering various aspects of these shops, including their facilities, operational controls, maintenance and sanitation protocols, personal hygiene standards, training practices, and record-keeping procedures. The survey was conducted using a structured questionnaire comprising 39 questions grouped into sections, each offering between two to nine response options depending on the subject matter. Additionally, demographic details such as age, gender, marital status, education level, relevant work experience, and training in food safety practices were included in the questionnaire.

This research focused on assessing the levels of general knowledge, attitudes, and food safety practices among dairy professionals. The study was conducted within local retail dairy shops and dairy departments of malls in Amman, Jordan. A total of 110 dairy shops were randomly selected for evaluation, and data collection occurred over a two-month period (March and April, 2024).

2.2. Ethical Approval

Ethical approval for this study was obtained from The Jordan University and participants were provided with information emphasizing confidentiality, voluntary participation, and the right to refuse involvement. Researchers explained the study's purpose to participants and assured them that declining to participate would not impact their work rights.

2.3. Pilot Study

A pilot study was conducted to collect feedback from participants regarding the clarity and content of the questionnaire. The questionnaire was distributed to a convenience sample (i.e., 15) of individuals who were not included in the final study sample. The questionnaire included open-ended items asking participants about the clarity of the questionnaire itself. No significant concerns were noted from these pilot samples.

2.4. Statistical analysis

Data was analyzed using JMP (release 10, SAS institute, Cary, NC). Descriptive statistics was performed to describe all variables. Chi-square was used to investigate the association between the study variables.

2

3

3. Results and Discussion

Table 1 shows the socio-demographic data for a total of 110 participants surveyed in this study. A total of 93% male and 7% females were surveyed. The respondents' majorly of survey participants were less than 35 years old. Over 85% of the participants have their secondary degree with 38% having first university degree. Experience ranged from 1 to 3 years to more than 8 years ranged from 28.2 and 23.7%, respectively. Furthermore, only 55% of the participants had food safety training and 62.4% are smokers.

Table 1. Socio-demographic characteristics of participate in the study.

Personal characteristics		Number	Percent (%)
Gender	Male	102	93.0
Gender	Female	8	7.0
	18-23	22	20.0
	24-29	24	21.8
A ()	30-35	29	36.3
Age(years)	36-41	19	17.2
	42-47	9	8.4
	>47	7	6.3
	Basic (no formal school)	5	4.7
F.L C	Primary school	11	10.0
Education	Secondary	52	47.3
	University	42	38.0
	<1	16	14.5
	1 to less than 3	31	28.2
Experience	3 to less than 5	18	16.3
	5 to less than 8	19	17.3
	>8	26	23.7
	Food safety training		
Yes		60	55.0
No		50	45.0
	Smoker		
Yes		69	62.4
No		41	37.3
<u> </u>	Risk of food		
Minimal risk		18	16.3
Moderate risk		47	42.7
Elevated risk		45	41.0

Santos et al., (2017) agreed with our results that the socio-demographic data show that workers are traditionally males who do not have advanced levels of formal education. The authors further reported that butchery workers usually performed by men (70.5%) with limited years of education. Gutema et al., (2021) also claimed that the majority of the employees were male with an age between 25-54 years. Although participants had secondary and university degrees people may adopt incorrect practices that result from lack of formal education and from the repetitive nature of the tasks associated with the job, which is contributed with lack of knowledge and of technically qualified personnel may translate into a greater risk for foodborne diseases (Santos et al., 2017).

Table 2 presents the Adherence of participants working in dairy retails shops to food safety knowledge. Results indicated a vast majority of participants having satisfactory food safety knowledge of dairy retails shops. For instance, more than 83% understands the recommended hygienic practices, have knowledge of the common steps that should be taken to ensure the safety of

4

dairy products, understand the importance of pathogens transmittance through dairy products and know that washing hands properly every half hour or when necessary is vital for food safety and reducing contamination. However, it appears a presence of none consistence responses or not accurate knowledge among respondents. For instance, between 37 only understood what "HACCP "related to what in food safety, 42% thinks that bacteria in food be killed by freezing at -18°C and 56% of the respondents thinks that contaminated food be discovered by tasting. Results were in consistence with Gutema et al., (2021) reports who indicated that respondent assume that frequent hand washing is an efficient way to reduce cross-contamination in meat where it is not economically possible to change gloves on a regular basis. Furthermore, it was noted by Birhanu et al., (2017) that a sizable percentage of workers in food processing shops and retail stores lacked rudimentary training in hygienic meat handling. Gutema et al. (2021) also indicated that 85.8% of retail store staff lacked training on hygienic food handling practices. Our results also in agreement with Santos et al., (2017) and Ramalho et al., (2015) who indicated that food handlers may generally adopt incorrect practices as a result of a lack of formal education and the repetitive nature of the tasks associated with their tasks. On the same manner, other authors revealed that a lower risk for foodborne illnesses may result from a lack of expertise and technically trained staff (De Boeck et al., 2016).

Table 2. Adherence of participants working in dairy retails shops to food safety knowledge.

Knowledge questions		Number	Percent (%)
1 December 1 and the control of the state of	Yes	84	76.3
1. Do you know the proper temperature for storing dairy	No	14	12.7
products to prevent bacterial growth? Don't		11	10.0
2 6 11 66 4 1 11	Yes	85	77.2
2. Can you identify common pathogens associated with	No	15	13.6
dairy products?	Don't know	10	9.2
2 4 61 111 1	Yes	92	83.6
3. Are you aware of the recommended hygiene practices	No	8	7.3
for handling dairy products?	Don't know	10	9.1
4 D 1 (1 (() 11 (1)	Yes	82	74.6
4. Do you know the symptoms of foodborne illnesses	Know	23	20.9
caused by contaminated dairy products?	Don't know	5	4.5
F. American Constitution of the Level Constitution of the Constitu	Yes	70	63.6
5. Are you familiar with the local food safety regulations	No	21	19.1
and requirements for selling dairy products?	Don't know	19	17.3
C. De como consistentia (allere de consenio de conse	Yes	74	67.3
6. Do you consistently follow these regulations in your	No	22	20.0
dairy retail business?	Don't know	14	12.7
7 Hans and some forest and shallow and an difficulties in	Yes	54	49.1
7. Have you ever faced any challenges or difficulties in	No	41	37.3
complying with food safety regulations?	Don't know	15	13.6
O Do was larger the accient was to appropriate	Yes	86	78.2
8. Do you know the easiest way to prevent cross contamination?	No	15	13.6
contamination:	Don't know	9	8.2
O Do was longer "IIA CCD "related to substitute d	Yes	41	37.3
9. Do you know "HACCP "related to what in food	No	34	30.9
safety?	Don't know	35	31.8
10. Do you know the stone that should be talied to account	Yes	92	83.6
10. Do you know the steps that should be taken to ensure	No	10	9.1
the safety of dairy products?	Don't know	8	7.4
11. Can hacteria in food he killed by freezing at 10 °C2	Yes	46	41.8
11. Can bacteria in food be killed by freezing at -18 °C?	No	44	40.0

	_		
	Don't know	20	18.2
	Yes	89	80.9
12. Do most pathogens grow in the moderate pH range?	No	12	10.9
	Don't know	9	8.2
	Yes	93	84.6
13. Are pathogenic bacteria transmitted through dairy?	No	12	10.9
	Don't know	5	4.5
14. Is washing hands properly every half hour or when	Yes	91	82.7
necessary important for food safety and reducing	No	11	10.0
contamination?	Don't know	8	7.3
	Yes	56	50.9
15. Is sterilization better than hand washing?	No	48	43.6
	Don't know	6	5.5
	Yes	62	56.4
16. Can contaminated food be discovered by tasting?	No	45	40.9
	Don't know	3	2.7

Table 3 presents the attitude of participants working in dairy retails shops to food safety. Results indicated that 90% of the survey participants have great awareness attitude when it comes to the safety of dairy retails shops. For instance, 98% of the participants agreed that it is importance to have a periodic examination of production areas to ensure their cleanliness and provide a healthy environment for the manufacture of dairy products. Also 95% and think it is vital to have a periodic inspection of the equipment and tools used in the storage and preparation of dairy products to ensure their safety. Our results indicates that participants benefited from better access to educational resources and training programs related to hygiene and food safety practices due to the presence of more educational institutions and training centers cities (Albaho et al., 2019). Moreover, urban residents tend to be more exposed to information campaigns, public health initiatives, and media coverage concerning hygiene standards and regulations, leading to higher awareness and better compliance with hygiene practices among slaughterhouse workers in urban settings. Additionally, urban areas typically boast superior infrastructure, including sanitation systems, clean water supply, and waste management services that may contribute to a cleaner and safer working environment, thereby facilitating the implementation of hygiene protocols (WHO, 2017).

Table 3. Attitude of participants working in dairy retails shops to food safety.

Attitude questions			nber	Percent (%)
1.	Do you think that food safety is important in dairy business?	Yes	103	93.6
1.		No	7	6.4
2.	Do you believe that providing safe dairy products is essential for	Yes	102	92.7
	customer satisfaction?	No	8	7.3
3.	Are you open to receive training or guidance on improving food	Yes	99	90.0
	safety practices?	No	11	10.0
4.	Do you feel confident to maintain food safety standards in your	Yes	103	93.6
	establishment?	No	7	6.4
5.	Is the cleanliness of equipment and surfaces in the storage and sale	Yes	103	93.6
	area verified?	No	7	6.4
6.	Do you have strict policies to deal with chemicals used in cleaning	Yes	102	92.7
	and sterilization?	No	8	7.3
7.	Are suppliers periodically evaluated to verify their food safety	Yea	99	90.0
	practices?	No	11	10.0
		Yes	103	93.6

8. Do you encourage your customers to report any problems or querie related to the quality or safety of dairy products?	es No	7	6.4
9. Are you taking specific actions to deal with employees who show	Yes	102	92.7
symptoms of an infectious disease that can be transmitted through dairy products?		8	7.3
10. Do you think that there is a periodic inspection of the equipment ar	nd Yes	105	95.5
tools used in the storage and preparation of dairy products to ensure their safety?		5	4.5
11. Do you think that there is a periodic examination of production	Yes	108	98.2
areas to ensure their cleanliness and provide a healthy environment for the manufacture of dairy products?	ne No	2	1.8
12. Should you check that the storage containers used meet health	Yes	101	91.8
standards and maintain product quality?	No	9	8.2
13. Are you mandatory to check expiration dates and remove expired	Yes	105	95.5
products from shelves?	No	5	4.5

Table 4 shows the compliance of participants employed in dairy retail establishments with food safety protocols. Results indicated that only 53.6% have a documented system in place for properly labeling and dating dairy products and more than 45% of participants did not receive any formal training on food safety practices specific to dairy products. Additionally, 51.8% indicated the importance of testing dairy products for physical quality standards including disintegration, hydrogen stability and density. However, it appears that participants have a satisfactory compliance and understanding to food safety protocols. For instance 90.9% indicated their understanding the importance of storing dairy products in designated places separately from other products. Moreover, 88.2 and 87.3% of participants follow special procedures to prevent contamination of dairy products and inspect dairy products for signs of spoilage or contamination, respectively.

Table 4. Compliance of participants employed in dairy retail establishments with food safety protocols.

Practices questions	N	Percent (%)	
1. Do you have a system in place for properly labeling and	Yes	59	53.6
dating dairy products?	No	51	46.4
2. Have you ever received any formal training on food safety	Yes	60	54.5
practices specific to dairy products?	No	50	45.5
3. Do you inspect dairy products for signs of spoilage or	Yes	96	87.3
contamination?	No	14	12.7
4. Do you store dairy products in designated places separately	Yes	100	90.9
from other products?	No	10	9.1
5. Do you do random samples and tests for dairy products to	Yes	84	76.4
verify their conformity with health specifications?	No	26	23.6
6. Do you follow special procedures to prevent contamination	Yes	97	88.2
of dairy products with foreign or harmful substances?	No	13	11.8
7. Are there special ways to deal with waste from storage and	Yes	96	87.3
preparation processes to ensure that dairy products are not contaminated?		14	12.7
8. Are the physical quality standards of dairy products tested,	Yes	57	51.8
such as disintegration, hydrogen stability and density?	No	53	48.2
9. Do you check the stability of the color, taste and aroma of	Yes	95	86.4
dairy products to ensure excellence and continuous quality?	No	15	13.6
10. Do you keep accurate temperature records in refrigerators	Yes	94	85.5
and storage units to ensure compliance with safety standards?	No	16	14.5

Our results agrees with Rowell et al., (2013), who indicated that retail workers staff usually do not have sufficient hygienic handling practices training. The author further reported following the training; after collect post-training data; the information from the observations indicated that the training did not cause a significant change in store performance for a majority of the observed categories. Additionally, according to the Health and Safety Authority (2005), good handling techniques are crucial to guaranteeing the safety and quality of food products. Furthermore, Augustin et al. (2020) demonstrated that developing preventive strategies to lessen the contribution to foodborne illnesses requires an understanding of hygienic handling procedures during production, processing, and distribution.

These findings illustration the need for training policy changes to assess and fulfill the quality of training programs. Moreover, findings suggested that within dairy retail, workers tend to be predominantly male and often do not possess higher levels of formal education (i.e., table 1). This demographic profile may contribute to a higher likelihood of adopting incorrect practices due to the combination of limited formal education and the repetitive nature of the tasks typical in this profession (Santos et al., 2017). Other research revealed that a risk for foodborne illnesses may result from a lack of expertise and technically trained staff (Al-Kandari et al., 2016).

4. Conclusion

There is a clear need to increase the focus on continuous training of workers to enhance their hygienic skills. Furthermore, it is important to conduct a comprehensive review of safety policies and implement effective improvements to ensure a safe work environment. Verifying manufacturing processes and quality to improve product quality is expected to increase customer satisfaction. Additionally, it is vital to implement targeted training programs for dairy retail vendors to enhance their knowledge of food safety practices. These programs should cover essential topics such as proper hand hygiene, safe food storage, and prevention of cross-contamination. Developing campaigns that focus on changing attitudes and promoting positive food safety behaviors is also essential to enhance the knowledge of food safety practices among dairy retail workers.

Investing in better infrastructure for dairy retail vendors, including access to clean water, proper waste disposal facilities, and adequate refrigeration, is also essential. Educating consumers about the importance of purchasing dairy products from vendors who prioritize food safety is crucial. This report reflects workers' desire to improve the work environment and product quality in the dairy industry and emphasizes the importance of management adopting the recommendations outlined in the questionnaire to achieve these goals.

Ethical Review: The study was approved by the Ethical Committee, the University of Jordan. Human testing was conducted after oral conscience was permitted from each participant.

Informed Consent: Written informed consent was obtained from all study participants.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare that they do not have any conflict of interest.

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