



# Impact of pandemic crisis: COVID-19 on food safety knowledge, attitudes and practices among food workers in Jordan

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## Abstract

**Purpose:** This study aims to evaluate the food handler's knowledge for potential sources of SRS-Cov-2 virus, the potential factors for controlling COVID-19 among food workers and to evaluate the participants' attitude and hygienic practice among food handlers working in food factories in Jordan during pandemic crisis: COVID-19.

**Methods:** A descriptive cross-sectional design was used in this study, during the period February to May 2020. Online questionnaire were used study in this study, since all food factories were completely shutdown as part of the Jordanian government's rules to control the outbreak..

**Results:** The Mean knowledge scores for the potential sources of SRS-Cov-2 virus was 5.8, which was considered as "poor Knowledge for potential sources of SRS-Cov-2 virus. In general, The mean knowledge scores about the awareness of food workers for the minimum requirements to control COVID-19 was 6.1, while the mean knowledge scores for the participants' attitude and hygienic practice among food handlers was 7.2, which considered as good. Our study showed that fair knowledge for food handlers in food safety doesn't necessary reflect their positive attitude. The overall scores for this study were 79.13%.

**Conclusions:** The overall score of this study was 63%. This revealed that food workers had fair knowledge about food safety and unsatisfied results about the sources of SRS-Cov-2 virus among food workers and need more practice for controlling COVID: 19 in food working areas.

**Keywords:** SARS\_CoV-2, COVID-19 pandemic, Food safety Knowledge, Jordan. Food safety attitudes

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## INTRODUCTION

SARS-Cov-2 virus is still affecting the life style and threatening the life of many people nationally and internationally. World Health Organization (WHO) put many regulations for all the countries to keep social distancing between individuals and working from distance to reduce the transmission of SARS-Cov-2 virus. In the food factories the ability to work from home is impossible, and the workers need to work in places and together, so keeping food workers safe along the food chain is very big challenge (Wei, W.et al. 2020).

All researches approved that SARS\_CoV-2 affects directly the respiratory system and is transmitted easily through droplets when infected persons are coughing or sneezing (Tong, Z. et al. 2020). The contamination of the surfaces and objects with heavy droplets will occur, So these inanimate objects can be good vehicles to transfer the virus (Tong, Z. et al. 2020). It was found that the survival time for SARS\_CoV-2 virus on plastic and stainless steel is up to 72 hours, on

copper up to four hours and on cardboard up to 24 hours (Wei, W.et al. 2020). However, most virus on the surface of common materials becomes inactive (noninfectious) after the first 24 hours (WHO, FAO. 2020).

The knowledge of food handlers in many local food factories and their attitude to hygiene food practices need evaluation in the light of COVID-19 pandemic. Their knowledge of the principles of food hygiene needs refreshing, to eliminate the risk of contamination of food, or food packaging as well as other surfaces during processing. (Sharif, L. et al. 2010).

The transmission of SRS-Cov-2 virus among food handlers will be a worldwide issue and preventing spreading of the virus have captured many organizations all over the world. FAO and WHO (2020) recognized the rules for controlling SRS-Cov-2 virus

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**Table 1.** Demographic features for food workers

Feature	Percentage (%)
<b>Gender</b>	
Female	(20 %)
Male	(80%)
<b>Age (years)</b>	
19–23	(29.5%)
24–29	(20.3%)
30–35	(25.3%)
36–41	(10.1%)
42–50	(9.6%)
> 50	(5.1%)
<b>Education</b>	
Basic (no formal school)	(22.8%)
Primary school	(50%)
Secondary	(15.5%)
University	(11.6%)
<b>Food safety training</b>	
Yes	(30.3%)
No	(69.7%)
<b>Work Experience (years)</b>	
0–1	(20.8%)
1–3	(40.5%)
3–5	(23.6%)
5–8	(10.6%)
> 8	(4.3%)

between food workers, written instructions should be provided for the staff workers and food safety training courses on how to prevent the spread of COVID-19 should be part from any food safety management system.

Although the training of food handlers will increase their knowledge about food safety this may not automatically be reflected in a more positive attitude (Mitchell, R. et al. 2007; Anaeto, et al, 2017).

In Jordan, many studies were done to estimate the hygienic levels in many food factories before COVID-19 pandemic (Osaili, T. et al. 2011). This research will be the first research in Jordan to evaluate the food handler's knowledge for potential sources of SRS-Cov-2 virus, the potential factors for controlling COVID-19 among food workers and to evaluate the participants' attitude and hygienic practice among food handlers working in food factories in Jordan during pandemic crisis: COVID-19.

## MATERIALS AND METHODS

### Study design

A descriptive cross-sectional design was used in this study, during the period February to May 2020 to evaluate the hygienic practices, food Safety knowledge and attitude during COVID-19 pandemic. Online questionnaire were used study in this study, since all food factories were completely shutdown as part of the Jordanian government's rules to control the outbreak.

### The participants

The social-demographic properties of the participants includes gender, age, years of experience, education and food safety training are presented in **Table 1**. Around 25 food factories from different locations across the country with a total of 500 food workers participated in this study. Depending on the educational background of the workers, a

questionnaires were sent by e mails then filed electronically (on-line) by the workers, other questionnaires were filled by our researchers after calling the workers by phones.

### Food questionnaire

The study targeted all food workers in food factories. The questionnaire was written in Arabic language and categorized into four parts. Part one specialized to collect data about the participants' demographic features as gender, age, level of education and the level of experience in food industry. Part two specified for food handler's knowledge for potential sources of SRS-Cov-2 virus, part three established to study the potential factors for controlling COVID-19 among food workers in food factories, part four was concerned with participants' attitude and hygienic practice. The questions were adapted from previous published research (Bolton, Meally, Blair, McDowell, & Cowan, 2008; Omemu & Aderoju, 2008). All questions, True-False questions and Five-point scale questions were tested randomly by 50-selected workers to manage the time of testing and check the clearance and understanding the questions. depending on pilot testing method, the questionnaire was satisfied.

Thirty questions classified into three categories; food handler's knowledge for potential sources of SRS-Cov-2 virus (ten questions), food handler's knowledge for potential factors for controlling COVID-19 among food workers in food factories (ten questions) and participants' attitude and hygienic practice (ten questions). The responses about knowledge and food safety attitudes were demonstrated as "True-False and Don-Know" questions, these questions specifically designed to check their knowledge about cross contamination, temperature abuse, symptoms of food poisoning. sanitation and disinfectant processes. Ten questions were recorded on a scale ranged from (0-10), food workers who recorded  $\leq 6$  points were classified as "poor Knowledge" and need further training courses, food workers who recorded  $\geq 7$  points were considered as "good knowledge".

Questions were specified for **food handler's knowledge for potential sources of SRS-Cov-2 virus** dealt with common sources for **Cov-2 virus**, as shaking hands, touching contaminated surfaces, touching food packaging and touching inanimate objects. Also questions were designed to evaluate the potential factors for controlling COVID-19 among food workers and to evaluate the participants' attitude and hygienic practice among food handlers working in food factories in Jordan during pandemic crisis: COVID-19. These questions required three options " Yes, No, and don't know". Food handlers who recorded  $\leq 6$  points were considered as food workers with "poor Knowledge for sources of SRS-Cov-2 virus ", Food workers who recorded  $\geq 7$  points were classified as " good Knowledge

**Table 2.** Mean knowledge scores of food safety aspects for food handlers during COVID-19

Food safety aspects for food handlers during COVID-19.	Mean knowledge scores	scores range	Percentage of correct responses (n)
Knowledge of potential sources of SRS-Cov-2 virus among food workers in food factories.	5.8	0-10	58% (290)
Knowledge of potential factors for controlling COVID-19 among food workers in food factories.	6.1	1-10	61% (305)
Knowledge of good hygiene Practice for food workers during COVID: 19 pandemic	7.2	1-10	72.1% (360)
Total knowledge score of food safety	18.9	1-30	63 % (315)

**Table 3.** Responses of Food handler's knowledge for potential sources of SRS-Cov-2 virus among food workers in food factories during COVID:19 pandemic; (n=500)

potential sources of SRS-Cov-2 virus	Yes (%)	No (%)	Don't know
1) From Air	303 (60.6)	113 (22.6)	84 (16.8)
2) Inhalation of large droplets during coughing and sneezing	485 (97.0)	150 (3.0)	0 (0.0)
3) Touching raw food	283 (56.6)	167 (33.4)	50 (10)
4) Touching food packaging	166 (33.3)	246 (49.2)	88 (17.5)
5) Touching contaminated surfaces	338 (67.6)	97 (19.4)	67 (13.3)
6) Fecal contamination	100 (32.7)	59 (11.8)	277 (55.5)
7) Hand shaking	444 (88.9)	43 (8.6)	12.5 (2.5)
8) Touching nose, mouth and eyes	274 (54.8)	177 (35.5)	48.5 (9.7)
9) Touching inanimate objects (door Knob, money ...)	159 (31.8)	112 (22.4)	229 (45.8)
10) From water	251.5 (50.3)	48.5 (9.7)	200 (40)

for sources of SRS-Cov-2 virus "(Afifi and Abushelaibi, 2012; Bolton, Meally, Blair, McDowell, & Cowan, 2008; Clayton and Griffith, 2004; Omemu & Aderoju, 2008).

### Statistical analysis

Data was analyzed using Excel and then imported into SPSS Version 15.0 (SPSS, Inc., Chicago, IL, USA) for analysis. The standard deviations and means were used as descriptive statistics. ANOVA test were used to study the relationship between food workers' features (educational level, age, workers experience, number of food safety training courses) and the score of food safety. the Knowledge scores were calculated by dividing the number of corrected answer over the total number of answers. P-value < 0.05 were considered to be statistically significant.

## RESULTS

### Demographic features

The demographic characteristics of 500 food workers are summarized in **Table 1**. The participants age was ranged from 19-50 years. Around 29.5% between 19 and 23 years; most of the food workers were male (80%). The educational levels were not satisfied, around 20.5% didn't attend school, 50% attained primary level. Only 30.3% of food workers had received food safety training courses. Around 60% of them had experienced years below 3 years.

### Food handler's knowledge for potential sources of SRS-Cov-2 virus

The Mean knowledge scores for the potential sources of SRS-Cov-2 virus was 5.8, which was considered as "poor Knowledge for potential sources of SRS-Cov-2 virus, around 97.0 % of food workers believed that Inhalation of large droplets during coughing and sneezing will play major rule for spreading SRS-Cov-2 virus, it was noticed that 88.9% of food workers knew that hand shaking between each other will facilitate spreading SRS-Cov-2 virus. On other hand, the

workers showed weak knowledge about the other sources for SRS-Cov-2 virus, such as; Touching raw food, touching food packaging, touching contaminated surfaces, touching nose, mouth and eyes and touching inanimate objects (door Knob, money...) (**Table 3**).

It is highly unlike that people can contract SRS-Cov-2 virus from food or food packaging. COVID-19 is described as air-borne disease, and the common routs for transmission will be through man to man contact and by direct inhalation the droplets which was generated by coughing and/ or sneezing of infected person. Up to date no evidence confirm transmission the viruses by touching food or food packaging, SRS-Cov-2 virus need host cell to multiply as animal or human, so it will not be able to multiply in food. WHO declared that virus is transmitted through droplets which are formed during coughing or sneezing, these droplets may reach nose and mouth of other persons. Because those droplets are heavy, so they will land on the surfaces and inanimate objects, So these objects may transfer SRS-Cov-2 virus and infect other persons. So shaking hands, touching nose, eyes and mouth and touching contaminated surface will be good sources for SRS-Cov-2 virus.

### Knowledge of potential factors for controlling COVID-19 among food workers in food factories

The awareness of food workers for the minimum requirements to control COVID-19 is presented in **Table 4**. The mean knowledge scores was 6.1, which considered as fair. They have a weak Knowledge about the importance of Personal Protective Equipments (PPE) to minimize the direct contact between workers and impair virus transmission. Around 64.6 % believed that PPE will be used to control SRS-Cov-2 virus, about 77.3% conducted that using disinfectant and hand sanitizers are effective practices to control COVID-19. Only 41.8 % of food workers demonstrated that reduction the numbers of employees in working areas will prevent overcrowding in working area and will reduce viral infection. It was noticed that 56.6% of food

**Table 4.** Responses of Food worker's knowledge of potential factors for controlling COVID-19; (n=500)

potential factors for controlling COVID-19	Yes (%)	No (%)	Don't know
1) Use Personal protective equipment (PPE) (disposable gloves, face masks, sleeves, clean apron).	323 (64.6)	93 (18.6)	84 (16.8)
2) Check the temperature for the employees and other COVID19 symptoms.	385 (77.0)	115 (23.0)	0 (0.0)
3) Adhere with physical distancing at least (2-m) among the workers.	283 (56.6)	158.5 (31.4)	60 (12)
4) Use spray disinfectants, hand sanitizers, surface sanitizers	387 (77.3)	61 (12.2)	55 (10.5)
5) Use signs for wearing gloves and mask and use floor signs for physical distance.	353 (70.6)	71 (14.1)	76.5 (15.3)
6) Use electronic reminders to warn the employees to keep physical distancing and clean and sanitize their hands.	284 (56.7)	164 (32.8)	53 (10.5)
7) Make a barriers between the employees and any gust at receiving area.	225 (44.9)	263 (52.6)	12.5 (2.5)
8) identify the most uses equipments and utensils (hand doors, scales, trolleys) and confirm their cleaning and disinfectants.	279 (55.8)	128 (25.5)	93.5 (18.7)
9) reduce and regulate the numbers of employees in working areas to prevent overcrowding.	209 (41.8)	112 (22.4)	179 (35.8)
10) Make working teams to reduce the interaction between the employees.	254 (50.3)	48.5 (9.7)	200 (40)

**Table 5.** Responses of good hygiene Practice for food workers during COVID: 19 pandemic; (n=500)

Questions on food poisoning	During COVID-19 Positive Answer (%)
1) Do you wash and sanitize your hands before food preparation?	71.5
2) Do you check the temperature for food and refrigerator periodically?	76.5
3) Do you separate between finished and raw food?	75.4
4) Do you think food workers are good source for pathogenic microbes?	65.9
5) Do you think wiping instead of washing is sufficient to keep food safe?	70.2
6) Do you think washing all vegetables and fruits can reduce food poisoning?	65.4
7) Do you think cleaning and sanitizing for all food contact surfaces is obligatory to reduce food poisoning?	55.3
8) Do you wear mouth mask, gloves and sleeves during food preparation?	75.1
9) do you think color coding technique for cutting boards, boxes, knives inside kitchen will reduce cross contamination?	86.4
10) Do you think viruses can be killed by heat?	78.4

workers adhere with physical distancing (2-meter) in working area. Only 56.7% of food workers agree to use electronic reminders to keep physical distance among food workers and clean and sanitize their hands.

#### Good hygiene Practice for food workers during COVID: 19 pandemic

Food safety attitudes for food workers have direct relationship with the incidence of food poisoning. Negative attitudes for food workers will increase the incidence of food poisoning (Azjen, I. and Fishbein, M. 1980, Belot, M. and James, J., 2009, Centers for Disease Control and Prevention, 2002).

The awareness of food workers toward good hygiene practice is presented in **Table 5**. Mean knowledge scores for Good hygiene Practice for food workers during COVID: 19 pandemic is 7.2, which is considered as good. Around 71.5 % of food workers thought that washing and sanitizing their hands before food preparation before will reduce food poisoning. it was found that 76.5% believed that checking the temperature for food and refrigerator periodically is important to control food poisoning. 75.1% of food workers agree to wear mouth mask, gloves and sleeves during food preparation, 70.2% of food workers declared that wiping instead of washing is sufficient to keep food safe. Most of food workers were aware about using color coding is good technique to prevent cross contamination.

In a previous study in South Africa it was found that the average correct answers for food handlers' knowledge ( $n = 159$ ) was 46.0% (McSwane, D. et al. 2003). In Ankara, Turkey, it was found that the percentage of food safety knowledge score for 764 food workers was 43.4%  $\pm$  16.3% (Bas, M. et al. 2006). In Portugal in a study consist from 124 food handlers in 32 school canteens, it was found that the food workers had

good knowledge about personal hygiene and cross contamination (Campos, A. et al. 2009). On the other hand, many studies declared that food handlers had low level in food safety knowledge (Belot, M. and James, J. 2009, Clayton, D. and Griffith, C. J. 2004).

In this research, it is clear that our food workers need more training about the expected sources of SRS-Cov-2 virus, and need more data about the risk factors that contribute to COVID-19 to enable them to control SRS-Cov-2 virus in food working areas. The knowledge of good hygiene practice for food workers during COVID: 19 pandemic should be improved by increasing the number of food safety training courses, also the governmental agencies should provide the food premises with written instructions and documents about SRS-Cov-2 virus. Up to date no data are available about the impact of COVID: 19 pandemic on food safety knowledge. In general, comparing with other studies carried out in United Kingdom, Turkey, Slovenia, Italy and Portugal, the Jordanian food handlers have a good knowledge in food safety. It was found that the food handlers in those countries had low level in the food safety knowledge (Afifi, H. S. & Abushelaibi, A. 2012, Almanza, B. et al. 2007, Ansari-Lari, M. et al. 2010, Hertzman, J. and Barrash, D. 2007, Hilton, J. 2002, Ko, W. H. 2010).

#### CONCLUSION

This research is the first research in Jordan which measured the food handler's knowledge for potential sources of SRS-Cov-2 virus, the potential factors for controlling COVID-19 among food workers and to evaluate the participants' attitude and hygienic practice among food handlers working in food factories in Jordan during pandemic crisis: COVID-19.

The overall score of this study was 63%. This revealed that food workers had fair knowledge about food safety and unsatisfied results about the sources of SRS-Cov-2 virus among food workers and need more practice for controlling COVID: 19 in working areas. The overall food safety results give a cause for more concern about the status of food safety during COVID: 19 pandemic. Enforcing the governmental regulations, increasing number of food safety training courses and

incentivizing positive attitude for food workers will improve food safety during COVID-19 pandemic.

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