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Original Article

Attitudes and behavior of adults about food safety during the COVID-19 pandemic

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ABSTRACT

Objectives: Ensuring food security is of global importance to prevent human exposure during the coronavirus disease (COVID-19) pandemic. This study aimed to evaluate the adult attitudes and behaviors regarding food safety during the period of the COVID-19 pandemic.

Materials and methods: The sample of the study consisted of 660 individuals (131 males, 529 females; median age: 25 [IQR 13.0]; range, 20 to 65 years) living in Turkey. The disinfection procedures that individuals apply to raw vegetables and fruits, their behavior during shopping, and their access to information regarding food safety during the COVID-19 pandemic were questioned. The data were analyzed using the Mann-Whitney U test and the chi-square test.

Results: In the disinfection of foods, adults preferred vinegar (95.6%) the most. The relationship between sex and disinfection of raw vegetables and fruits was found to be statistically significant ($p<0.05$). It was determined that 98.8% of the participants paid attention to social distancing during shopping, 99.2% wore masks, and information regarding food safety was accessed more via social media (57.3%).

Conclusion: It was determined that changes occurred in individuals' attitudes and behaviors regarding food safety during the pandemic. Further studies are needed to determine the impact of changes in COVID-19 and food safety on humans.

Keywords: Communication methods, COVID-19, food safety, social distancing.

The coronaviruses (CoVs), first discovered in the 1960s, are classified under the Coronaviridae family, the largest family of the Nidovirales order.[1,2] Three types of coronaviruses have been encountered in the human population in the past two decades. SARS-CoV emerged in 2002, MERS-CoV in 2012 and SARS-CoV-2 in December 2019 in Wuhan province of China.[3,4] The disease caused by SARS-CoV-2 has been named "COVID-19" by the World Health Organization (WHO). Many people have been infected and died because of the new type of coronavirus. As of 8 November 2020, the number of COVID-19 cases detected worldwide increased to 100,819,363, and the number of deaths due to COVID-19 to 2,176,159.[5]

Although the first cases were associated with the Huanan Seafood Market, the source of the new type of coronavirus is not known with certainty.[6] It is suggested that coronavirus may be directly transmitted from animals or indirectly from contaminated food.[7] It has been stated in some studies that pangolin, snake and bat may be the origin of the new type of coronavirus.[2,8,9] The new type of coronavirus, thought to be passed from infected wild animals to humans, can be easily transmitted from person to person through droplets.[10]

Wild animal consumption in China from past to present poses a risk to food safety.[11] Protection of wildlife and regulation of food safety is of

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global importance to prevent people from being exposed to the new type of coronavirus.[12,13] There has been no study that suggests that COVID-19 is caused by the consumption of fresh foods. However, food safety practices should be considered during the preservation, preparation, and consumption of foods.[14]

In this study, attitudes and behaviors regarding food safety of adults aged 20 to 65 living in Turkey at the time of the pandemic (COVID-19) were examined. Thus, the obtained data are important in terms of reflecting the behavior of adult individuals during the pandemic.

MATERIALS AND METHODS

The universe and the sample of the research

The universe of this descriptive study consisted of adults between 20-65 years of age living in Turkey. This descriptive and correlational type of research has not been done face to face due to the transmission of COVID-19 by inhalation or contact. "Google Forms" was used for the survey. The questionnaire was uploaded to "Google Forms" on 16.04.2020 and the questionnaire was delivered to the participants electronically. No restrictions were made in the study except for not being included in the universe. Although 666 individuals participated in the study, when demographic characteristics were examined, six participants who were determined not to represent the universe were excluded from the study. As a result, 660 randomly selected adult individuals (131 males, 529 females; median age: 25 (IQR 13.0); range, 20 to 65 years) formed a sample. A written informed consent was obtained from each participant. "Ethics Committee Approval" dated 15.04.2020 and numbered E.4925 was obtained from Artvin Coruh University Scientific Research and Publication Ethics Committee for this study. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data collection methods

A literature review on food, nutrition, and food safety issues was conducted during the COVID-19 pandemic.[11,14-17] Afterwards, expert opinion was received from a total of 10 academics and dietitians. Thus, a questionnaire form consisting of 30 questions was prepared. The survey consisted of four sections. In the first part, demographic characteristics and anthropometric measurements of individuals were questioned. In this study, those with a body mass index (BMI) of <18.5 kg/m^2 were considered underweight, those with a BMI of 18.5-24.9 kg/m^2 were considered normal, those with a BMI of 25.0-29.9 kg/m^2 were considered overweight, and those with a BMI of ≥30 kg/m^2 were considered obese. In the second part, the disinfection processes of vegetables and fruits served raw, in the third part, the behaviors of individuals during shopping and in the fourth and final part, the methods of accessing information regarding food safety during the pandemic were questioned.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). The normal distribution of continuous variables was analyzed using the Kolmogorov-Smirnov test and the data showed non-normal distribution. For this reason, continuous variables are expressed in median (Interquartile range [IQR]). Number (n) and percentage (%) distributions were used in the analysis of qualitative data. The Mann-Whitney U test, a non-parametric test, was used to assess the difference between the sexes. Whether there is a statistical relationship between disinfectant preferences, shopping methods, ways of accessing information regarding food safety and sex was tested by chi-square analysis. All statistical calculations were evaluated at a 95% confidence interval and $p<0.05$ significance level.

RESULTS

The median BMI values for females and males were 22.5 (IQR 4.6) and 25.3 (IQR 4.6) kg/m^2, respectively. The difference between BMI values and sexes was found to be statistically significant ($p<0.05$) (Table 1). When socio-demographic and economic data were analyzed, it was determined that the majority of individuals were single (females: 68.2% and males: 50.4%). In this study, 1.7% of individuals are in primary school, 2.6% are in secondary school, 25.8% are in high school, 54.6% are in undergraduate study and 15.3% are in graduate study. The level of education between sexes was found statistically significant ($p<0.05$). 9.1% of the participants are healthcare workers and 90.9% are non-working

Table 1. Distribution of descriptive characteristics of individuals

	Women (n=529)				Men (n=131)				Total (n=660)			
General features	n	%	Median	IQR	n	%	Median	IQR	n	%	Median	IQR
Age (year)			25.0	13.0			30.0	18.0			25.0	13.0
Weight (kg)			60.0	13.5			78.0	15.0			63.0	18.0
Height (cm)			163.0	8.0			175.0	8.0			165.0	10.0
BMI (kg/m^2)	22.5	4.6			25.3	4.6			23.3	5.1		
Weak	39	7.4			3	2.3			42	6.4		
Normal	359	67.8			56	42.7			415	62.9		
Overweight	94	17.8			55	42.0			149	22.5		
Obese	37	7.0			17	13			54	8.2		
Marital status												
Married	168	31.8			65	49.6			233	35.3		
Single	361	68.2			66	50.4			427	64.7		
Region												
Rural	65	12.3			13	9.9			78	11.8		
Urban	464	87.7			118	90.1			582	88.2		
Income status												
<Minimum wage	175	33.1			41	31.3			216	32.7		
>Minimum wage	354	66.9			90	68.7			444	67.3		
Working status												
Healthcare workers	57	10.8			3	2.3			60	9.1		
Outside the health sector	185	35.0			87	64.4			272	41.2		
Not working	287	54.2			41	31.3			328	49.7		
Chronic disease												
Yes	125	23.6			32	24.4			157	23.8		
No	404	76.4			99	75.6			503	76.2		

n: Participants; IQR: Interquartile range.

or in non-healthcare sectors. In addition, it was determined that a large part of the individuals (67.3%) had an income above the minimum wage (Table 1). 23.8% of the individuals who participated in the study stated that they have a chronic disease. It was determined that the most common chronic disease was vitamin-mineral deficiency (28.7%) and the second most common was respiratory system diseases (17.8%) (Table 1).

In Table 2, disinfectants used and individual preferences in disinfection processes of raw vegetables and fruits are shown. According to the results, it was determined that the majority of individuals (62.3%) disinfected vegetables and fruits consumed raw due to concern of coronavirus. In addition, it was found that there is a statistically significant relationship between the application of disinfection and sex ($p<0.001$). It was seen that

Table 2. Disinfection processes applied to raw vegetables and fruits during the COVID-19 pandemic

	Women (n=529)				Men (n=131)				Total (n=660)				
	n	%	n	%	n	%	n	%	n	%	n	%	*p*
Disinfection of raw vegetables and fruits	349	66.0	180	34.0	62	47.3	69	52.7	411	62.3	249	37.7	0.000†
Disinfectants*													
Vinegar	335	96.0	14	4.0	58	44.3	73	55.7	393	95.6	18	4.4	0.000†
Sodium hypochlorite (Bleach)	6	1.7	343	98.3	5	3.8	126	96.2	11	2.7	400	97.3	0.032‡
Any detergent	15	4.3	334	95.7	2	1.5	129	98.5	17	4.1	394	95.9	0.397
Sodium carbonate	17	4.9	332	95.1	1	0.8	130	99.2	18	4.4	393	95.6	0.123
Thyme juice	3	0.9	346	99.1	1	0.8	130	99.2	4	1.0	407	99.0	0.796
Lemon juice	19	5.4	330	94.6	5	3.8	126	96.2	24	5.8	387	94.2	0.902
Acetic acid	1	0.3	348	99.7	0	0.0	131	100.0	1	0.2	410	9.8	0.618
Vegetable-fruit extracts	1	0.3	348	99.7	2	1.5	129	98.5	3	0.7	408	99.3	0.042‡

n: Participants; * More than one option is marked; † $p<0.001$; ‡ $p<0.05$; Pearson chi-square test.

Table 3. Evaluation of individuals' shopping habits during the COVID-19 pandemic

	Women (n=529)				Men (n=131)				Total (n=660)				
	n	%	n	%	n	%	n	%	n	%	n	%	*p*
Shopping habits													0.032‡
Did not change any	310	58.6	219	41.4	68	51.9	63	48.1	378	57.3	282	42.7	
I'm getting more food than you need	172	32.5	357	67.5	57	43.5	74	56.5	229	34.7	431	65.3	
I get less foods than I need	47	8.9	482	91.1	6	98.5	125	1.5	53	8.0	607	92.0	
I pay attention to social distance	524	99.1	5	0.9	128	97.7	3	2.3	652	98.8	8	1.2	0.208
I am wearing gloves	398	75.2	131	24.8	87	66.4	44	33.6	485	73.5	175	26.5	0.041‡
I wear a mask	525	99.1	4	0.8	130	99.2	1	0.8	655	99.2	5	0.8	0.993
I take packaged foods instead of open foods	482	91.1	47	8.9	104	79.4	27	20.6	586	88.2	74	11.2	0.000†
When I go home, I immediately remove the bags and wash my hands	518	97.9	11	2.1	128	97.7	3	2.3	646	97.9	14	2.1	0.881
The most preferred food group													0.004‡
Grain and products	51	9.6	478	90.4	21	16.0	110	84.0	72	10.9	588	89.1	
Vegetable and fruit	231	43.7	298	56.3	38	29.0	93	71.0	269	40.8	391	59.2	
Meat, eggs and legumes	131	24.8	398	75.2	45	34.4	86	65.6	176	26.7	484	73.3	
Dairy products	70	13.2	459	86.8	12	9.2	119	90.8	82	12.4	578	87.6	
Snacks	46	8.7	483	91.3	15	11.4	116	88.6	61	9.2	599	90.8	

n: Participants; † p<0.001; ‡ p<0.05; Pearson chi-square test.

the rate of application of disinfection in females (66.0%) was higher than that of males (47.3%). Among the disinfectants, the most preferred was vinegar (95.6%) and the rate of females preferring vinegar is higher than that of males (p<0.001). It was found that 5.8% of all individuals disinfect raw vegetables and fruits with lemon juice. The least preferred disinfectant was acetic acid. There is no significant relationship between individuals' income levels, education level, marital status, presence of chronic disease and their preferences to disinfect vegetables and fruits consumed raw (p>0.05). However, a statistically significant relationship was found between the region and the preferred disinfection process (p<0.05).

When the shopping habits of individuals during the pandemic were questioned, 57.3% reported that they received as much food as they needed, 34.7% reported that they received more food than they needed, and 8% reported that they received less food than they needed. A statistically significant relationship was found between shopping habits and sex (p<0.05). Almost all of the individuals stated that they paid attention to social distancing (98.8%) and wore masks (99.2%) during shopping. In addition, there is a significant relationship between the region of residence and wearing a mask (p<0.05). No statistically significant relationship was found between the region of residence and adaptation to social distance.

When the most preferred food group during the pandemic was questioned,it was found that vegetables and fruits (40.8%) were preferred more than other food groups. Among the foods purchased, the least preferred foods were snacks (Table 3). It has been stated that carbohydrate-rich foods were preferred usually due to their satisfying effect (51.7%). When we questioned the individuals on their access to information regarding food safety during the period of "social isolation", we found that 57.3% reported social media as the medium of information.

DISCUSSION

COVID-19 has spread to many countries in the world, including Turkey. In this case, the production, transportation, storage and consumption of foods should be done safely. Cross contamination that may occur in the food chain is likely to pose a risk for food safety.[18] COVID-19 is usually transmitted through contact with people carrying the virus or the act of respiration.[19] It may be possible for a person to be infected with COVID-19 by touching a contaminated surface or

object and then touching their mouth, eyes, or nose, but this is not considered to be the main way of transmission of the virus.[14] In recent studies, the survival time of the COVID-19 virus on surfaces has been evaluated. It has been reported that the new type of coronavirus can survive up to 72 h on stainless steel and plastic surfaces, up to 24 h on cardboard, and 4 h on copper.[20,21] According to the data obtained from this study, 97.9% of individuals stated that the bags they used for shopping were contaminated and that they immediately removed the bags when they came home and washed their hands (Table 3).

It is important to maintain a social (physical) distance to slow the spread of COVID-19. With social distancing, contact between infected and healthy individuals is minimized.[22] World Health Organization recommends that the distance between individuals should be at least one meter. Maintaining social distance between individuals is an issue to be considered both in serving and purchasing food.[23] The studies emphasize that social distancing is necessary and effective.[24,25] In this study, when we asked individuals if they paid attention to social distancing during shopping, almost all of the individuals (98.8%) stated that they paid attention to social distancing (Table 3). In a study conducted with individuals living in the United States and England, the rates of individuals who wore masks were determined to be 37.8% and 29.7%, respectively.[15] In this study, the rate of individuals who wore masks (99.2%) was shown to be higher. It was determined that gloves (73.2%) were used as another protective measure. However, WHO recommends washing hands frequently instead of using gloves.[23]

One of the important issues for ensuring food safety is the washing and disinfection processes of vegetables and fruits consumed raw.[26] In a study, it was stated that instead of disinfecting the food to protect oneself from COVID-19, the food packaging can be disinfected with detergent water, 70% alcohol disinfectant, or 1.0% sodium hypochlorite.[21] In this study, individuals were asked whether they apply disinfection to raw vegetables and fruits to protect themselves from COVID-19. 62.3% of individuals stated that they applied disinfection with any type of disinfectant. The most preferred disinfectant was vinegar (95.6%) (Table 2). These disinfectants are associated with the destruction of total coliform bacteria and total aerobic mesophilic bacteria in particular and are used to provide surface decontamination of raw vegetables and fruits.[27,28] However, no report has been published by the Centers for Disease Control and Prevention, United States Department of Agriculture and Food and Drug Administration which suggests that COVID-19 can be transmitted by food or recommends the disinfection of food.[29] World Health Organization, on the other hand, recommends that individuals wash their hands with soap and water before touching vegetables and fruits, and that food is washed with plenty of water.[23]

It was shown in this study that the most preferred food group of individuals during the pandemic was the vegetable and fruit group (40.8%) (Table 3). It is estimated that vegetables and fruits are preferred due to the vitamin C they contain. This is because vitamin C is thought to inhibit COVID-19 due to its antioxidant effect.[30] Various studies have been conducted to evaluate the antiviral effect of vitamin C against COVID-19. Some studies suggest that high-doses of vitamin C are beneficial while some studies do not have sufficient evidence.[31,32]

In a study, it was stated that COVID-19 affects individuals' eating behaviors and emotional states.[33] It has been determined that the reason for the preference for carbohydrate-rich foods is due to their saturating feature (51.7%). In this case, research is needed to evaluate the emotional eating and shopping behaviors of individuals during the social isolation period.

Countries called on their citizens to stay at home to prevent the spread of COVID-19 and control the disease.[12,34] Therefore, individuals started to spend more time at home. Accordingly, it has been shown in studies that individuals' time spent in digital media has increased.[35] In parallel with this study, 57.3% of individuals stated that they started to access information regarding food safety through social media. However, it should be remembered that some information on social media can be misleading.[5]

One limitation of the study is that data were collected by considering the opinions of individuals. Therefore, qualitative data constitute a large part of the data obtained from the study.

Also, data could not be collected face-to-face as COVID-19 is transmitted through contact or the act of respiration. For this reason, individuals were approached only electronically.

In conclusion, we found that individuals started to exhibit different attitudes and behaviors regarding food safety compared to their normal lives during the period of the COVID-19 pandemic. Further large-scale studies are needed to investigate individuals' attitudes and behaviors regarding food safety during the period of the COVID-19 pandemic from different perspectives. COVID-19, which has influenced the world for a long time, should also be evaluated with new quantitative and prospective studies.

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