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Covid-19 outbreak and household food waste: evidence from Turkey

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Abstract

This study aims to examine changes in food-related behaviours that occur in Turkish households due to the Covid-19 outbreak and their effect on food waste amounts. An online survey was conducted and the survey included questions about socio-demographic characteristics, food purchasing, preparation, cooking behaviour, and food waste. This study included 610 respondents. 33.9% of the participants stated that there was a decrease in the amount of food waste during the pandemic period. More than half (52.2%) of those who think that there is a decrease in the amount of food waste stated that the amount of waste decreased because the food was consumed without forgetting/spoiling due to the increase in the time spent at home. Also, a relationship was found between changes in some food-related behaviours (frequency of food shopping, preparing/cooking, the characteristic of the food purchased, the person who prepares/cooks the meal, the time spent in the kitchen, the number of meals, trying new recipes, making bread at home, ordering to home and eating out) and changes in food waste. It has been observed that the changes experienced influence the reduction of food waste. In conclusion, the necessary initiatives should be taken to make permanent the positive changes caused by Covid-19 in food-related behaviour.

Keywords: Covid-19, Food Waste, Household Habits

Introduction

World Health Organization (2020) announced the existence of the Covid-19 pandemic caused by SARS-CoV-2 on March 11, 2020. The Covid-19 pandemic is not the first pandemic in the history of humanity. Humanity has faced various pandemics in previous times (e.g., SARS, Ebola, and MERS). First detected in China in December 2019, the COVID-19 has spread to six continents in a short time after its appearance (WHO, 2020).

According to currently available evidence of the SARS CoV-2 virus that causes Covid-19, it is stated that the main route of person-to-person transmission is respiratory droplets. Hand contact with surfaces contaminated with infectious droplets and then contact with the mouth, nose, or eyes also appear to be an indirect transmission route. The SARS-CoV-2 virus is highly contagious and has very high mortality rates, especially for the elderly (CDC, 2020).

Pandemics pose a severe threat to public health and social stability. Therefore, many countries worldwide have advised their communities to stay at home and implemented extraordinary public health measures to limit the spread of the transmission since there is no specific treatment or vaccine for the disease at the start of the Covid-19 pandemic. With these measures, it was intended to reduce and delay the transmission of the pandemic in society, reduce the burden on health systems, and provide the best possible care for patients,

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reducing case numbers to low levels by social distancing all populations (CDC 2020; IMF 2020).

According to the United Nations Food and Agriculture Organization, about a third (i.e., 1.3 billion tons) of food produced globally is wasted each year (FAO, 2019). Food loss and waste are considered one of the most important sustainability issues that cause economic, social, and environmental downsides and must be addressed globally. Food waste prevention and reduction are a critical issue for sustainable development and profitability, especially in low- and middle-income countries, and is also among the Sustainable Development 2030 targets (SDGs). Within the scope of SDG 12 (Target 12.3), it is aimed to reduce food waste at the retail and consumer level by half by 2030 (UN, 2015).

Food loss and waste occur at all stages of the food supply chain (from harvest to consumption), but it is stated that the biggest contribution comes from households (EPRS, 2014; FAO, 2011, Williams et al., 2012). Research into a better understanding of the causes of food waste generated at the household level and determining the amount of waste has recently become an important interest of the academic and social area. It is estimated that the amount of food waste generated in households constitutes more than 50.0% of the total food waste in Europe (Kummu et al., 2012) and 60.0% of the total food waste in the USA (Griffin et al., 2009). Research in the UK has shown that the amount of food and drink waste at the household level accounts for about 22.0% of all food and drink purchased (330 kg per household per year). It was stated that 65.0% of this waste (215 kg per household each year) was the edible condition before it was disposed of (WRAP, 2009). In other studies, it was determined that an average household in Denmark is approximately 105 kg per year and in Finland 63 kg (Koivupuro et al., 2012; Silvennoinen et al., 2014). Looking at the studies, it is seen that most of the studies on food waste in households were in developed countries. Information on food waste in households in developing countries is insufficient. Turkey is one of these countries. Yıldırım et al. (2016) determined that 31.3% of the participants threw away food 1-2 times a week, 27.3% created less than 250 grams of waste in a week. Ündevli et al. (2019), 34.7% of the participants found that the frequency of throwing food was less than once a week. Songür Bozdağ and Çakıroğlu (2021) stated that 32.9% of the participants generated 0-1 kg of food waste in a week and the main reasons for food waste were found to be mouldy food, food left in the refrigerator for too long, and the date expiration of food. In the COMCEC (2017) study, it has been determined that the main reason for the generation of food waste is "expired product."

During the Covid-19 pandemic, there was an increase in the time spent in homes due to measures taken by governments, which led to various changes in food production-consumption behaviour and lifestyles. Perhaps no outbreak (SARS, Ebola, MERS, etc.) in history to date has led to a rapid and radical change in society's food consumption behaviours and lifestyles as much as the Covid-19 pandemic. For this reason, this study was conducted to provide a prediction during the pandemic of Covid-19, how people make decisions about food, behavioural changes, and the impact of these changes on food waste, and shed light on future research.

Materials and Methods

Survey design and data collection

In this study, during the Covid-19 pandemic in Turkey, investigating the change in behaviour related to food in households was conducted between May and September 2020. A questionnaire was prepared by the researchers based on the studies in the literature on food waste (Aschemann-Witzel et al., 2017; Gaiani et al., 2018; Mallinson et al., 2016; Ponis et al., 2017; Stefan et al., 2013; Szabó-Bódi et al., 2018; Tucker & Farrelly, 2015).

Survey consists of 3 parts. First part socio-demographic characteristics (gender, education, marital status, income etc.), second part information on food purchasing, preparation-cooking before and during the pandemic period (food shopping person, shopping place, the person who prepared-cooking food etc.) and third part is multiple-choice and open-ended questions about their knowledge of food waste generated in their households (amount of avoidable food waste in the last week, discarded foods, change in the amount of waste etc.).

The questionnaire was applied in Turkish on Google Forms and delivered to the participants through the researcher's social media accounts. All participants read and approved the informed consent form before starting the survey. At the end of the study, between the ages of 19-65, 610 people responsible for at least half of food shopping and preparation in their household were reached.

For the study, necessary permissions were obtained from the Ministry of Health Scientific Research Platform and Ankara University Ethics Committee (2020-14/199).

Data analysis

Data were shown as the frequency and percentage for nominal variables, the median, and the interquartile range (IQR) for continuous variables. Chi-square independence tests were used for associations between changes in food purchasing, preparing, cooking, and the amount of food waste. Statistical significance was determined by $p < 0.05$ at a 95% confidence interval.

Results

According to the socio-demographic results the average age was 32.46 ± 8.75 (min: 19, max: 65) years old; it was seen that most of them were females (85.2%), have a higher education level (83.0%-undergraduate + postgraduate), working (78.4%) and more than half of them were married (53.9%). Furthermore, the median value of the monthly income of the households was 6500 TL (920 USD), the median values of the number of individuals living in the household, the number of women, and the number of children under the age of 18 were determined as 3, 1 and 0; respectively (Table 1).

Table 2 shows the changes in the food dynamics of households during the pandemic period. Before the outbreak, more than half of the participants (54.1%) did their food shopping at their homes by "themselves". In comparison, 21.1% stated that there was a change in the person responsible for food shopping in the household during the pandemic period. 37.7% of those who stated that there was a change in the person

who food shopping said that "myself/my sibling "instead of their mother/father began to do it so during the pandemic. In the pre-outbreak period, it was determined that the participants mostly (62.1%) shopped in supermarkets, that the outbreak led to changes in where 23.4% of participants shopped. Almost half of those who stated that there was a change (49.7%) now shop "online" instead of "supermarket/grocery/bazaar". When the effect of the outbreak on the frequency of shopping in households was evaluated, 50.3% of respondents stated that there was a "decrease" in the frequency of shopping. During the pandemic period, the characteristics of the food purchased in 34.3% of the households have changed. The main change was to more prefer "packaged products" (47.4%).

In the pre-pandemic period, 59.4% of the participants stated that they were responsible for preparing/cooking food at home. During the outbreak period, only 10.5% of households was a change in the person responsible. When asked if there was any change in the frequency of food preparing/cooking in households, 61.1% of respondents reported an "increased." More than half of the participants (63.9%) stated that there was an "increased" in the time spent in the kitchen to prepare meals. During the outbreak, 64.1% of households tried new recipes, 49.8% started making their bread, and 38.0% had an increase in food variety. It was also found that 65.2% of participants had a decrease in the frequency of ordering food at home, and 87.0% had a reduction in the frequency of eating out (Table 2).

Table 1. Participant profiles (n= 610)

	n	%
Gender		
Female	520	85.2
Male	90	14.8
Education		
Primary school	10	1.6
Middle school	8	1.4
High school	61	10.0
Undergraduate	379	62.1
Postgraduate	152	24.9
Occupation		
Healthcare worker	94	15.4
Private sector	88	14.4
Teacher	80	13.1
Self-employment	77	12.6
Academician	59	9.6
Student	59	9.6
Housewife	51	8.4
Civil servant	41	6.7
Engineer	40	6.6
Retired	12	2.0
Unemployed	9	1.6
Marital status		
Single	329	53.9
Married	251	41.2
Divorced/Widowed	30	4.9
	Median (IQR)	**Minimum-Maximum**
Household income	6500 TL (5000 TL) = 920 USD (710 USD)	1000 TL – 40000 TL = (145 USD – 5670 USD)
Household size	3 (2)	1-10
Number of female	1 (1)	0-5
Number of children under 18 age	0 (1)	0-5

Table 2. Changes in food purchasing, preparing, and consuming in households

	n	%
Person responsible of food shopping before the outbreak		
Myself	330	54.1
My partner	100	16.4
My father	69	11.3
My mother	61	10.0
My partner and me	23	3.8
My sibling	10	1.6
All family members	7	1.1
My mother and father	6	1.0
My child/children	2	0.3
My helpmate	2	0.3
Changing the person responsible of food shopping		
Yes	159	26.1
No	451	73.9
Changing		
My mother/My father → Myself /My sibling	60	37.7
Myself → My partner/ My home mate	58	36.5
My partner and me → My partner	12	7.5
My mother or My father → My father or My mother	8	5.0
My partner → Myself	7	4.4
Myself → My partner and me	6	3.8
All family members → Myself	3	1.9
Myself → My mother/ My father	3	1.9
Myself → My child/children	2	1.3
Food bought place before the outbreak		
Supermarket	379	62.1
Supermarket + Bazaar	123	20.2
Online	23	3.8
Supermarket + Online	23	3.8
Supermarket + Grocery	20	3.3
Supermarket + Greengrocer	17	2.7
Bazaar	15	2.5
Grocery	10	1.6
Changing food bought place		
Yes	143	23.4
No	467	76.6
Changing		
Supermarket/grocery/ bazaar à Online	71	49.7
Supermarket + bazaar à Supermarket	30	21.0
Supermarket à Grocery store, etc. (near to home)	26	18.2
Bazaar à Supermarket	5	3.5
Bazaar à Greengrocer	5	3.5
Online à Supermarket/grocery/bazaar	3	2.1
Supermarkets à Hypermarkets	3	2.1
Food shopping		
Increased	159	26.1
Not changed	144	23.6
Decreased	307	50.3
Changing characteristics of the purchased food		
Yes	209	34.3
No	401	65.7

Table 2. Changes in food purchasing, preparing, and consuming in households (continue).

Changing		
I/we get to more prefer packaged products	99	47.4
I/we get to more prefer durable foods	48	22.9
I/we get to more prefer healthy and fresh foods (vegetables, fruits, etc.)	39	18.7
I/we get to more prefer organic products	23	11.0
Person responsible of preparing/cooking food before the outbreak		
Myself	362	59.4
My mother	170	27.9
My partner	52	8.5
My partner and me	10	1.6
My helpmate	7	1.1
My mother and me	6	1.0
My sibling	3	0.5
Changing person responsible of preparing/cooking food		
Yes	64	10.5
No	546	89.5
Changing		
My mother → Myself	21	32.8
Myself/My partner → My partner/ My mother/ My child/ My sibling	18	28.1
My mother → My mother and me	12	18.8
Myself/My partner → My partner/My mother/My sibling and me	10	15.6
My helpmate → Myself/My partner	3	4.7
Food preparing/cooking		
Increased	373	61.1
Not changed	231	37.9
Decreased	6	1.0
Time spent in kitchen		
Increased	390	63.9
Not changed	215	35.2
Decreased	5	0.9
Type (number) of food prepared/cooked		
Increased	232	38.0
Not changed	360	59.0
Decreased	18	3.0
Trying new recipes		
Yes	391	64.1
No	219	35.9
Starting to make bread at home		
Yes	304	49.8
No	306	50.2
Food ordering to home		
Increased	6	1.0
Not changed	206	33.8
Decreased	398	65.2
Eating out		
Increased	-	-
Not changed	79	13.0
Decreased	531	87.0

In 63.6% of the households participating in the study, the avoidable food waste that occurred in the last week was "0-250 g" and the main raw and cooked food products were thrown into the garbage were vegetables (44.3%) and cereal/legume meals (21.3%). The main reason for throwing food into the garbage was that the food is mouldy, degraded, etc. (21.0%) (Table 3).

When evaluated the change in the amount of preventable food waste that occurred in households during the outbreak, 33.9% of respondents stated that a "decrease" in the amount of food waste, and 7.0% of them stated that an "increase."72.1% of those who thought there was an increase in the amount of food waste stated an increase in the amount of food waste because they "cook more" due to the increase in time spent at home. Also, the main reason for the decrease in the amount of food waste was food consumption without forgetting/spoiling due to the increase in the time spend at home of participants (52.2%). It was determined that 33.3% of the households made an initiative to reduce waste during the pandemic period, and the main initiative applied by the households "to make better meal planning" (Table 3).

The relationship between changes in purchasing, preparing, consuming food in households during the pandemic period and the difference in the amount of food waste was shown in Table 4.

Table 3. Information about food waste in households

	n	%
Amount of avoidable food waste (last week)		
0-250 g	388	63.6
251-500 g	124	20.3
501-750 g	42	6.9
751 -1000 g	30	4.9
1001-1500g	12	2.0
1501-2000 g	6	1.0
2001 g and above	8	1.3
Discarded raw food		
Vegetables	270	44.3
Fruits	89	14.6
Meat and meat products	36	5.9
Milk and dairy products	8	1.3
Cheese-egg	4	0.7
Oilseeds and dried nuts and fruits	4	0.7
Cereals and legume products	3	0.5
Oils	1	0.2
Discarded cooked food		
Cereal - legume meals	130	21.3
Vegetable meals	66	10.8
Soups	39	6.4
Pastry / desserts	34	5.6
Meat meals	20	3.3
Bread	18	3.0
Egg	15	2.5
Milk and dairy products	4	0.7
Reason of food waste		
Formation of mould, etc. on the food	128	21.0
Poor meal planning	111	18.2
Poor food shopping planning	87	14.3
Storage of food for an excessive period of time in the refrigerator/ store cupboard	39	6.4
Dislike of food/meal	20	3.3
Erroneous preservation (storage) method	17	2.8
Expired products	14	2.3
Fear caused by the virus	8	1.3
Amount of food waste		
Increased	43	7.0
Not changed	360	59.0
Decreased	207	33.9

Table 3. Information about food waste in households (continue).

	n	%
Reason of increase		
Preparing/cooking more food due to spending more time at home	31	72.1
Buying more food	12	27.9
Reason of decrease		
Consumption of foods in a short time without forgetting/spoilage with the increase of time spent at home	108	52.2
More conscious and careful purchasing	63	30.4
Better meal planning with increased time spent at home (the required amount of cooking etc.)	36	17.4
Extra initiatives to reduce food waste		
Yes	197	32.3
No	413	67.7
Initiatives		
Better meal planning	80	40.6
Utilizing leftover meals/foods in different ways	36	18.3
Better shopping planning	24	12.2
Ensuring that food is consumed without spoiling by paying more attention to the control of the refrigerator/food cabinet	20	10.2
Paying more attention to preservation (storage) methods	17	8.6
Eating more regularly with the increase of time spent at home	14	7.1
Better portion control	6	3.0
Effect of making bread on bread waste		
Increased	13	4.3
Not changed	172	56.6
Decreased	119	39.1

Table 4. Relationship between changes in food purchasing, preparing and consuming, and food waste in households

Changes in food purchasing, preparing and consuming	Change in the amount of food waste						p
	Increased		Not changed		Decreased		
	n	%	n	%	n	%	
Person responsible of food shopping							
Yes	8	5.0	85	53.5	66	41.5	0.05
No	35	7.7	275	61.0	141	31.3	
Food bought place							
Yes	11	7.7	75	52.4	57	39.9	0.182
No	32	6.9	285	61.0	150	32.1	
Food shopping							
Increased	24	15.1	82	51.6	53	33.3	
Not changed	8	5.6	105	72.9	31	21.5	**<0.001**
Decreased	11	3.6	173	56.4	123	40.0	
Characteristics of the purchased food							
Yes	16	7.7	95	45.5	98	46.9	**<0.001**
No	27	6.7	265	66.1	109	27.2	
Person in responsible of preparing/cooking food							
Yes	2	3.1	28	43.8	34	53.1	**0.002**
No	41	7.5	332	60.8	173	31.7	

Table 4. Relationship between changes in food purchasing, preparing and consuming, and food waste in households (continue).

Changes in food purchasing, preparing and consuming	Change in the amount of food waste						
	Increased		Not changed		Decreased		p
	n	%	n	%	n	%	
Food preparing/cooking							
Increased	36	9.7	184	49.3	153	41.0	**<0.001***
Not changed	7	3.0	17	74.0	53	22.9	
Decreased	-	-	15	83.3	1	16.7	
Time spent in kitchen							
Increased	33	8.5	197	50.5	160	41.0	
Not changed	10	4.7	160	74.4	45	20.9	**<0.001***
Decreased	-	-	3	60.0	2	40.0	
Type (number) of food prepared/cooked							
Increased	26	11.2	108	46.6	98	42.2	**<0.001**
Not changed	17	4.7	239 13	66.4	104	28.9	
Decreased	-	-		72.2	5	27.8	
Trying new recipes							
Yes	31	7.9	204	52.2	159	39.9	**<0.001**
No	12	5.5	156	71.2	51	23.3	
Starting to make bread at home							
Yes	20	6.6	165	54.3	119	39.1	**0.025**
No	23	7.5	195	63.7	88	28.8	
Food ordering to home							
Increased	-	-	6	100	-	-	
Not changed	11	5.4	148	71.8	47	22.8	**<0.001***
Decreased	32	8.0	206	51.8	160	40.2	
Eating out							
Increased	-	-	-	-	-	-	
Not changed	8	10.1	578	73.4	13	26.5	**0.002**
Decreased	35	6.6	302	56.9	194	36.5	

Food wastage decreased in 41.5% of those who had a change in the person responsible for food shopping in the household and 31.3% of those who did not.

There was no statistically significant difference between the change in the responsible person for food shopping, food shopping place and the amount of food waste in households. Food wastage decreased in 33.3% of the participants whose shopping frequency increased and 40.0% of the participants whose shopping frequency decreased. The difference between the change in shopping frequency and food waste was statistically significant ($p<0.001$).

A statistically significant difference was observed between the change in the characteristics of foods purchased and the change in the amount of food waste ($p<0.05$). There was a decrease in the amount of food waste in 46.9% of the households who stated a change in the characteristics of the food they bought, and 27.2% of those who stated that there was no change.

53.1% of those who stated that there was a change in the person preparing/cooking food at home during the outbreak, and 31.7% of those who stated that there was no change, the change in the amount of food waste generated in their household was in the direction of a decrease. It was found that the relationship between the change in the person responsible for preparing food in households and the change in the amount of food waste was statistically significant ($p=0.002$). 41.0% of those who have increased the frequency of preparing/cooking at home and 16.7% of those who have decreased stated a decrease in the amount of food waste at home. Considering the change in the time individuals spend in the kitchen to prepare meals and the change in the amount of food waste in households; 41.0% of those who stated that the time they spent in the kitchen increased, and 20.9% of those who did not change in terms of time stated that the amount of food waste in their homes decreased. The difference between the frequency of preparing/cooking at home, the change in time spent preparing/cooking food, and the change in the amount of food waste that occurs in households is statistically significant ($p<0.05$).

During the pandemic period, it was determined that 42.2% of respondents who had an increase in the variety of food preparing/cooking in their household, 39.9% of those who tried new recipes, and 39.1% of those who started making their bread at home had a decrease in the amount of food waste. It

was determined that there was a significant difference between the variety of food preparing/cooking, the changes related to trying new recipes and making own bread, and the change in the amount of food waste generated in households ($p<0.05$). It was found that 40.2% of the participants whose frequency of ordering food at home decreased, and 36.5% of those whose frequency of eating out decreased had a decrease in the amount of food waste generated at their homes. The difference between the frequency of ordering food to home and consuming food outside and the change in the amount of food waste at home are statistically significant ($p<0.05$).

Discussion

The Covid-19 pandemic has led to many changes in people's daily lives around the world. This study aimed to examine the changes in food-related behaviour in households during the Covid-19 pandemic in Turkey and the effect of these changes on the food waste.

In the household of 63.6% of the study participants, between 0-250 g of preventable food waste was generated in the last one week, and the most discarded raw and cooked food products are vegetables and cereal/legume meals. As the main causes of food waste, it has been found that, mould, deterioration, etc. and poor shopping-meal planning. When the food wastes generated in households during the outbreak are examined, 33.9% of respondents said it had "decreased, "and 7.0% said it had" increased." According to the participants, the main reason for the decrease in the amount of waste is the consumption of food without forgetting/spoiling due to the increase in time spent at home. Also, the increase in food waste was more food preparing/cooking (72.1%) and more food purchasing (27.9%). This finding suggests that the increase in food waste, even if only for a small part of the participants in our sample, is due to panic purchasing, which pushes them to buy more food than they need. 32.3% of the participants attempted to reduce food waste in their households, and their main reduction initiative (40.6%) is to do better meal planning (Table 3). Muştu et al. (2020) conducted a study in Istanbul province, it was determined that the most wasteful foods during the quarantine process are vegetables and fruits, and the most important cause of waste is food degradation. Also, in the study carried out by Güneysu (2020) in Istanbul, it was observed that food wastes were mostly in vegetables/fruits, and food wastes decreased by 26.0% compared to before the quarantine. In the study conducted in Tunisia (Jribi et al., 2020), approximately 58.0% of the participants stated that they usually discarded small amounts of food, and 29.7% did not throw away any food. It has been determined that the most wasted foods in households were bakery products and vegetables, and the main reasons why food is thrown away were overcooking, inappropriate storage, and overbuying. In the same study, the main measures applied to reduce food waste were found good food shopping management, leftovers, and attention to expiration dates. Principato et al. (2020) in Italy stated that food waste in households decreased significantly during restrictions compared to the pre-Covid-19 period and that the decrease in food waste in all food categories was found especially in bread. It has also been found that using leftovers for new recipes both in the pre-Covid-19 period and during restrictions has a strong association with reduced food waste. In the study conducted by Pappalardo et al. (2020) in Italy, 33.0% of the participants stated that food waste decreased significantly and 5.5% increased. The reasons for the decrease in waste were changes in eating and cooking habits, having more time to prepare and cook meals, and financial constraints. Also, the food waste amount has been associated increased food stock, increased in the amount of food purchased, and the amount of food cooked.In another study conducted in Italy, it was concluded that more than half of the participants (53.7%) reduced food waste in their households (Scacchi et al., 2021). In a study that included participants from the U.S. and Italy, approximately half (49.0%) of respondents reported a decrease in food waste during the Covid-19 pandemic than before the pandemic (Rodgers et al., 2021). When the studies carried out in different countries or cultures are generally evaluated, it is seen that the lockdowns experienced during the pandemic have a positive effect on the reduction of food waste generated in households. It is believed that the main reasons for this positive effect were exhibit more conscious behaviour due to the fear of not being able to access the food created by the pandemic on people and improvements in food management behaviour due to the increase in time spent in households.

Food shopping behaviour is considered one of the foremost effective factors in reducing food waste (Aschemann-Witzel et al., 2015; Farr-Wharton et al., 2014; UNEP, 2014). Giordano et al. (2019) found that increasing the frequency of shopping had a negative effect on the amount of food waste in households. In this study, it was determined that the rate of stating that the amount of food waste decreased was higher among those whose shopping frequency decreased during the pandemic compared to the other groups ($p<0.05$) (Table 4). The decrease in shopping frequency maybe since purchases are made one time and one place due to health concerns. In addition to shopping frequency, 23.4% of individuals changed their shopping places due to the pandemic. Nearly half (49.7) of those who experienced this change stated that they started online shopping (Table 2). Principato et al. (2020) also found a 3-fold increase in online shoppers during the pandemic restrictions compared to before the Covid-19 pandemic. Consumers chose to online shopping, possibly out of fear of infection, wanting to avoid densely populated areas due to long queues in shopping places such as supermarkets. Although the difference between the change in the place for shopping and the change in the amount of food waste is not statistically significant in this study that we have done, this result may change with the development of infrastructures that allow more individuals to online shopping.

The Covid-19 outbreak has caused changes in the characteristics of the food consumers to buy. Scacchi et al. (2021) has found a decrease in the purchase of fresh products that can deteriorate quickly, characterized by short shelf life. Our study determined that 34.3% of the participants had a change in the characteristics of the foods they purchased. This change was mainly in the direction of packaged products and long-lasting/durable product preferences. The effect of the change in the characteristics of the purchased food on the

amounts of food waste is statistically significant (Table 4) ($p<0.05$). Participant's preference for packaged products may be due to the possibility that they think unpacked products are more easily infected with the virus. In addition, packaged products are also products with a long shelf life. Also, participants may have intended to shop less, preferring durable products. All these reasons may have led to the purchase of durable products and decrease in discarded food products caused by deterioration.

53.1% of households with a change in the person responsible for preparing/cooking meals, 41.1% of those who increased the frequency of preparing/cooking at home, 41.0% of those who increased spent time in the kitchen preparing/cooking meals, 42.2% of those who increased the number of meals they prepared/cooked, 40.2% of those who decreased ordered food from outside to home and 36.5% of those who decreased the frequency of eating out stated decreased in food waste amounts (Table 4). Muştu et al. (2020) found that ready-made food consumption decreased during the quarantine process and that individuals usually make their meals at home. Principato et al. (2020) determined that as the number of meals consumed at home increased during the restriction period, and the amount of food waste decreased. Studies conducted before the pandemic have also shown that cooking at home is associated with fewer amounts of food waste (Marangon et al., 2014; Roodhuyzen et al., 2017). Due to the pandemic, with the increase of time spent in the homes and the restriction of eating out, individuals tended to cook and consume more at home. This situation has also increased the timely use of purchasing food products. It is believed that individual's tendency to prepare/cook their food contributes to reducing food waste positively affecting their awareness of food purchasing, preparing, and cooking.

It was observed that there was an increase in searches for recipes on Google during the pandemic period (Laguna et al., 2020). 64.1% of respondents said they had tried new recipes in the process (Table 2). 49.9% of those who tried new recipes and 23.3% of those who did not try any recipe stated a decrease in the amount of food waste (Table 4). New recipe attempts may cause food to be discarded unnecessarily if there are deficiencies in people's cooking ability (Porpino et al., 2015). In this study, the higher percentage of those who said there was a decrease in food waste among those who tried new recipes may be due to the good ability of individuals to cook. Also, food waste may have decreased, as the consumption of the meals is increased by providing variety in meals with new recipes and avoiding monotony.

Bread, one of Turkey's main food products and has a very important place in meeting daily nutritional needs, is also considered the main reason why the amount of solid waste increases over the years. 4.9 million pieces of bread are wasted daily (1.7 billion pieces per year) in Turkey (Kılınç Şahin & Bekar., 2018). Almost half (49.8%) of respondents started making their bread at home during the pandemic period (Table 2), and 39.1% of those who made their bread at home had decreased bread waste amounts (Table 3). It is highly gratifying that bread, which is important in society's nutrition and has a large amount of waste, has reduced the amount of waste. This reduction may be due to individuals baking their bread affecting their awareness of food waste.

Conclusion

Our results revealed a sudden and profound change in food-related (buying, preparing-cooking, etc.) behaviours in people in our country as well as in other countries around the world. These changes have brought along positive effects on food waste. Although food waste has always been a sensitive issue in our society, the desired level of food waste reduction has not yet been achieved. Although the Covid-19 pandemic has caused many crises in societies, it may have provided a good opportunity for sustainable food production and consumption. In order to maintain the positive behaviours that occur during the pandemic, to raise awareness about the consequences of food waste and the benefits of prevention, it is necessary to increase education and communication campaigns for the community by policymakers and practitioners.

As a result, our study has contributed to a better understanding of how such a crisis affects consumer's food-related behaviour and has raised food waste awareness during the crisis. The mechanisms underlying our findings can be fully clarified by the qualitative studies to be carried out to continue this study. At the end of the qualitative studies, various sustainable recommendations to address food waste can be developed using detailed information obtained from consumers.

Compliance with Ethical Standards

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contribution

The contribution of the authors is equal. All the authors read and approved the final manuscript. All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

Ethical approval

Necessary approval was obtained from the Ankara University Ethics Committee. (Decision No: 199, Protocol No: 2020/56673, Date: 24.07.2020).

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Data availability

Not applicable.

Consent for publication

Not applicable.

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