

Research Article

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Monitoring nutrient orientations and changes in physical activity during three periods (at the beginning, during and after the pandemic)

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ABSTRACT

Objective: Changes in the dietary habits of volunteer participants before, during, and after the pandemic were analyzed.

Methods: In this study the questionnaire was distributed to individuals via Google form internet connection in 2021-2023.

Results: 1323 people participated in the study. When compared before and after the pandemic, a significant difference was found in the consumption of fortified foods ($p < 0.001$), functional foods ($p < 0.001$), foods that strengthen the immune system ($p < 0.001$) and probiotic and prebiotic ($p < 0.001$) foods. Physical activity levels decreased significantly during and after the pandemic compared to before the pandemic. Consumption of all food groups in healthcare workers, students, and other groups (retired, unemployed, etc.) increased significantly during the pandemic. There was a significant difference in probiotic and functional food consumption before and after the pandemic. Compared to before and after the pandemic, pre-probiotic consumption decreased from 59.30% to 40.70%. Functional food consumption decreased from 55.30% to 44.30%.

Conclusion: It is seen that the pandemic changed the dietary habits of individuals, but after the pandemic, individuals' interest in these foods decreased and they returned to their pre-pandemic diet.

Keywords: COVID-19, Nutritional habits, Pandemic,

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Functional food, Supplementary food.

INTRODUCTION

Coronavirus (COVID-19) is a disease that affects the world. Effects of COVID-19 such as fever, trouble breathing, lung infection, and pandemic symptoms have appeared [1]. It causes a life-threatening danger in individuals with the effect of these symptoms [2]. All countries have decided to combat this pandemic. First of all, it has started to struggle with two methods. The epidemic was wanted to be prevented by social isolation in healthy individuals [3]. World Health Organization (WHO) has emphasized the importance of healthy nutrition other than these methods. For this reason, author drew attention to the importance of individual protection and healthy nutrition [4].

The importance of a healthy and balanced diet was explained to individuals, and society was informed [4]. During situations with increased requirements (e.g., infection, stress, and pollution), the immune system is activated and thus increases the energy demand. The immune system weakens if it cannot meet the need [5]. It was emphasized that those who survived the disease during the pandemic period had weak immune systems [6]. In this process, individuals have antioxidants, flavonoids, vitamins, fruits and vegetables, dietary fiber, protein, etc. They are advised to consume diets rich in nutrients. Additionally, WHO; stated that smoking, drinking alcohol, eating rich in excess carbohydrates and saturated fats and an unbalanced diet negatively affect the immune system. On the other hand, the public has long been informed that such diets will cause obesity, diabetes, and cardiovascular disorders. It has been stated that these diseases are the riskiest groups during the pandemic [7].

During the pandemic, individuals were asked to consider these warnings. Studies have emphasized that a healthy diet will also have a positive effect on overcoming this disease [6]. Additionally, it has been stated that physical activity and staying away from stress will affect the strengthening of the immune system [8]. In this process, quarantines, measures, and strict measures taken by countries to prevent the epidemic create unwanted stress in society [9]. Pandemic; forced changes in the life flow of individuals such as economy, education, social relations, and communication. It can be said that this change in daily life creates stress in a large part of society [10].

In a study, it was observed that the level of physical activity decreased significantly and there was an increase in the time spent sitting during the day. A decrease in physical activity primarily poses the risk of obesity. In the research, author explained that people should make physical movements in their homes and pay attention to the energy taken to be equal to the energy given [6,11]. It is aimed to examine the status of the volunteer participants in their eating habits during and after the pandemic and the changes in their daily lives.

MATERIALS AND METHODS

Study type

It is a survey conducted with people between the ages of 18-65. The study consists of individuals in Turkey and Turkish society. Information was obtained from volunteer individuals three times by survey method between March-April 2021, February-March 2022, and April 2023, and these three periods were named Group 1 (G1), Group 2 (G2), and Group 2 (G3), respectively.

Study group

While G1 and G2 were asked questions about the pre-pandemic and post-pandemic periods, G3 was asked questions about the pandemic period and post-pandemic period. 1323 people participated in the online survey.

Procedures

The online survey method was used to deliver and fill out the survey by individuals through the Google Form Internet tool. Since data confidentiality was important during the preparation of the study, name-surname/identification number information was not requested. Age information was not asked in detail (day/month/year), only every year (e.g. 22). The survey consists of two parts. The first part consists of social-demographic questions. The second part, it is aimed to determine the effect of the pandemic

on the nutritional habits, physical activities, and behavior styles of individuals. Yes/No options were determined for the survey questions.

Height and body weight measurements are based on the declaration. Body Mass Index (BMI) was calculated by dividing body weight (in kilograms) by the square of height (in meters) [12].

This questionnaire does not include socio-demographic questions and consists of 10 questions. The reliability level of these questions was calculated over 88 participants before the research. The result was categorized as "very reliable" (Cronbach's alpha=0.797).

Statistical analysis

The SPSS 22 version program did the statistical analysis. The suitability of variables to normal distribution was examined using analytical methods (Kolmogorov-Smirnov, Shapiro-Wilk tests). Descriptive statistics were done by giving percentile values for normally distributed variables. Mann-Whitney analyzed the dependent groups between continuous variables. The chi-square test was used for independent groups. Values with a p-value less than 0.05 were considered statistically significant and OpenEpi Version 3.01 software was used for power analysis. As a result of the power analysis, it was found sufficient that at least 385 people participated.

Ethical considerations

All participants were informed of the study and completed a consent form. It was taken from Kastamonu University's Nonclinical Research Ethics Committee on Humans (10.03.2021-Number of meetings=3, Decision=6). The study was conducted per the ethical standards in the Declaration of Helsinki.

RESULTS

This study was carried out in a certain period (2021, 2022, and 2023) in three separate years. Therefore, groups representing each period were formed (G1, G2, and G3). The study consisted of 1323 people in total, with G1=472, G2=390, and G3=461.

Nutrient supplement use increased from 25% to 30% in the G1 to G2 and decreased to 22% in the G3. Consumption of functional foods increased from 27% to 30% in G1 to G2 and decreased in G3 (24%). It was observed that while the use of pre-probiotics was 48% in G1, it decreased to 40% in G2 and again increased to 54% in G3 (Figure 1).

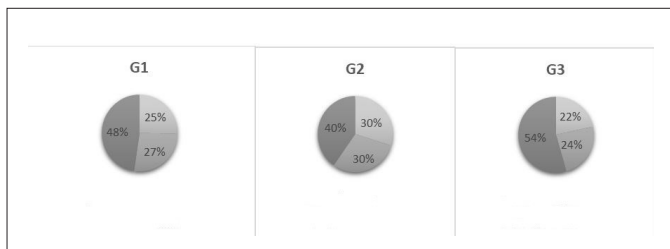


Figure 1. Food supplements, functional food, and prebiotics-probiotics use preferences of the groups.

Note: (■): Supplement; (■): Functional food; (■): Prebiotic/Probiotic

1323 people participated in the study, 63.10% of them are women. Just over half of the respondents (55.40%) are married. The participation rate of individuals between the ages of 51 and 65 in the survey is low. The proportion of young people in other age groups is higher. 19.00% of the study group consists of health workers, 12.80% SGK employees, 22.10% civil servants, the majority (33%) university students, and 13.10% other (workers, housewives, retired, etc.).

81.30% of the participants did not have chronic diseases. 53.60% of individuals are normal weight, 28.90% are overweight, 11.30% are obese and 6.10% are underweight. During the pandemic, 21.90% of people use cigarettes and 52% think that functional foods are healthy (Table 1).

Table 1. Social-demographic characteristics.

	N	%
Age classification		
18-25	529	40.00
26-35	368	27.81
36-50	334	25.20
51-65	92	7.00
Total	1323	100
Gender		
Male	530	39.30
Female	803	60.70
Total	1323	100
BMI classification		
Underweight (18.5-19.9)	81	6.10
Normal weight (18.5-24.9)	709	53.60
Overweight (25.0-29.9)	383	28.90

Obesity (≥ 30.0)	150	11.30
Total	1323	100
Do you have a chronic disease?		
No	1075	81.30
Diabetes mellitus	98	7.40
Metabolic disease	150	11.30
Total	1323	100
What is your employment status?		
Healthcare worker	252	19.00
Social Security Institution (SSI)		12.80
Government Official	292	22.10
University student	433	33.00
Other (retired, housewife, unemployed)	173	13.10
Total	1323	100
Incident status for not smoking during the pandemic		
Yes	289	21.90
No	436	33.00
Never smoked	597	45.20
Total	1322	100
Are functional foods a healthy product		
Yes	688	52
No	635	48
Total	1323	100

A comparison was made regarding the consumption of products before and after the pandemic, and a significant difference was observed in functional food intake, food supplements, functional foods, immune-boosting foods, and prebiotic-probiotic products.

In addition, there is a significant decrease in the physical activity status of individuals (Table 2).

When the pre-pandemic and during-pandemic conditions were compared, there was a significant increase in the use of prebiotic-probiotics food supplements, and functional foods in healthcare workers, students, and other groups compared to the pre-pandemic period.

While there was a significant increase in the use of food supplements in the SGK and civil servant groups, there was no significant difference in the consumption of prebiotic-probiotic and functional food (Table 3).

There was a significant difference between the pre-

pandemic working areas in the use of prebiotics and probiotics. Considering the consumption of nutritional supplements and functional foods, there was a

significant difference between the working areas during the pandemic process, but no difference was observed before the pandemic (Table 4).

Table 2. To examine the status of nutritional habits and physical activity.

Group	The nutrient items before the pandemic	During the pandemic		Total (n)	P-value
		Evet (n)	Hayir (n)		
Have you consumed any food supplement	Yes	193	33	226	<0.001
	No	197	439	636	
Total		390	472	862	
Have you been in physical activity more than one time a week	Yes	180	237	417	0.001
	No	143	302	445	
Total		323	539	862	
Have you consumed functional foods	Yes	273	44	317	<0.001
	No	129	416	545	
Total		402	460	862	
Have you consumed any prebiotic and probiotic products	Yes	502	22	524	<0.001
	No	123	234	357	
Total		625	256	881	
Have you consumed any nutrients to strengthen your immune system	Yes	551	39	590	<0.001
	No	131	141	272	
Total		682	180	862	

Note: *McNemar's Chi-Square test was used, p<0,05 was considered significant

Table 3. Comparing prebiotics-probiotics supplement, and functional food consumption before and during the pandemic.

Working area		Prebiotic and probiotic consumption				Food supplement consumption				Functional food consumption				
		Before the pandemic	During the pandemic		Total	p	During the pandemic		Total	p	During the pandemic		Total	p
			Yes	No			Yes	No			Yes	No		
Healthcare worker	Yes	7	4	11	<0.001	49	11	60	<0.001	60	10	70	<0.001	
	No	52	54	106		57	72	129		51	68	119		
Total		131	58	189		106	83	189		111	78	189		
Social Security Institution (SSI)	Yes	4	4	8	0.077	21	3	24	<0.001	30	8	38	0.648	
	No	12	35	47		19	73	92		11	67	78		
Total		16	39	55		40	76	116		41	75	116		

Government Official	Yes	102	8	110	0.076	38	5	43	<0.001	45	9	54	0.405
	No	18	41	59		42	84	126		14	101	115	
	Total	120	49	169		60	89	169		59	111	169	
University Students	Yes	194	4	198	<0.001	60	9	69	<0.001	97	13	110	<0.001
	No	24	60	84		58	155	213		37	177	172	
	Total	218	64	282		118	164	282		134	148	282	
Others (retired, housewives, unemployed)	Yes	63	2	65	<0.001	25	5	30	0.002	11	4	45	0.012
	No	17	24	41		21	55	76		16	45	61	
	Total	80	26	106		46	60	106		57	49	106	

Note: *McNemar's Chi-Square test was used, $p < 0,05$ was considered significant

Table 4. Comparison of pre-pro biotic, nutritional supplement and functional food consumption in the study areas before and during the pandemic.

Working area	Prebiotic and probiotic consumption					
	During the pandemic			Before the pandemic		
	Yes	No	p	Yes	No	p
Healthcare worker	131	58	0.122	83	106	<0.001
Social Security Institution (SSI)	76	39		68	47	
Government official	120	49		110	59	
University students	218	64		198	84	
Others (retired, housewives, unemployed)	80	26		65	41	

Working area	Food supplement consumption					
	During the pandemic			Before the pandemic		
	Yes	No	p	Yes	No	p
Healthcare worker	106	83	0.003	60	129	0.24
Social Security Institution (SSI)	40	76		24	92	
Government official	80	89		43	126	
University students	118	164		69	215	
Others (retired, housewives, unemployed)	46	60		30	76	
Working area	Functional food consumption					
	During the pandemic			Before the pandemic		
	Yes	No	p	Yes	No	p
Healthcare worker	111	78	<0.001	77	119	0.334
Social Security Institution (SSI)	41	75		38	78	
Government official	59	110		54	115	
University students	134	148		110	172	
Others (retired, housewives, unemployed)	57			45	61	

Note: *Chi-Square test was used, $p < 0,05$ was considered significant

A significant difference was observed between G1 and G2 for all food groups (prebiotic-probiotic, nutritional supplement, functional food) during the pandemic process. When we look at the pre-pandemic period, there was a significant difference between G1 and G2 in nutritional supplement and prebiotic-probiotic consumption, but there was no significant difference in functional food consumption.

When the pre-pandemic and pandemic periods of G1 were compared within themselves, a significant difference was found in the consumption of nutritional supplements and prebiotic-probiotics. When the pre-pandemic and pandemic

process of G2 was examined within itself, a significant difference was observed in all food groups (Table 5).

There was a significant difference in prebiotic-probiotic and functional food consumption between pre-pandemic and post-pandemic. It was determined that the use of pre-probiotics decreased from 59.30% to 40.70% when compared before and after the pandemic.

functional food consumption also fell from 55.70% to 44.30%. Physical activity levels decreased significantly after the pandemic. There was no significant difference in dietary supplement intake (Table 6).

Table 5. Before the pandemic and during the pandemic assessment of G1 and G2.

	During the pandemic			p ^a	Before the pandemic			p ^b	p ^c	p ^d
	Yes	No	Total		Yes	No	Total			
G1	184	288	472	<0.001	93	379	472	<0.001	<0.001	<0.001
G2	206	184	390		133	257	390			
	During the pandemic			0.002	Before the pandemic			0.181	0.081	<0.001
	Yes	No	Total		Yes	No	Total			
G1	197	275	472		183	289	472			
G2	205	185	390		134	256	390			
	During the pandemic			0.434	Before the pandemic			<0.001	0.008	<0.001
	Yes	No	Total		Yes	No	Total			
G1	347	124	471		328	143	472			
G2	278	112	390		196	194	390			

Note: G1: Group1, G2: Group2. During the pandemic G1-G2 (p^a), before the pandemic G1-G2 (p^b), during the pandemic and before the pandemic G1 (p^c), during the pandemic and before the pandemic G2-G1 (p^d)

Table 6. Change in pre-pro biotic, nutritional supplement, functional food consumption and physical activity status before and after the pandemic.

Time	Prebiotic and Probiotic Consumption				Food Supplement Consumption				Functional Food Consumption				Physical Activity			
	Yes	No	Total	p	Yes	No	Total	p	Yes	No	Total	p	Yes	No	Total	p
Before the pandemic	524	337	861	<0.001	226	636	862	0.348	517	545	862	<0.001	417	445	862	<0.001
After the pandemic	360	101	461		110	355	461		252	209	461		169	292	461	

Note: *McNemar's Chi-Square test was used. p<0,05 was considered significant

DISCUSSION

The results of the study showed that there was a decrease in individuals' physical activity levels during and after the pandemic. Also, eating habits have changed. While there was a significant increase in consumption of food supplements, functional foods, immune-boosting foods, and probiotic-probiotic products during the pandemic process, prebiotic-probiotic consumption and functional food consumption decreased after the pandemic compared to the pre-pandemic period, and there was no significant difference in nutritional supplements. Nutrient supplement use increased from 25% to 30% in the G1 to G2 and decreased to 22% in the G3. Consumption of functional foods was almost similar in G1 and G2 but decreased in G3 (24%). It was observed that while the

use of pre-probiotics was 48% in G1, it decreased to 40% in G2 and again increased to 54% in G3. In addition, when the conditions before and during the pandemic were compared, there was a significant increase in the use of prebiotic-probiotics, food supplements, and functional foods in health workers, students, and other groups compared to the pre-pandemic period.

Cihan and Piringçi stated in their study that young people are physically affected by the pandemic and tend to be inactivity, their quality of life is adversely affected, and there is an increase in the probability of them falling into depression. Changing diet and physical activity with the effect of this process can lead to other diseases such as obesity and diabetes in individuals [13]. Since the course of COVID-19 disease varies in individuals with chronic

diseases, careful follow-up is recommended [14]. It is recommended that individuals who are malnourished with nutrients consume supplements. The majority of those who used nutritional supplements (75.80%) and herbal products (86.20%) during the pandemic stated that they used these products to protect themselves from COVID-19 and to strengthen their immune systems [15]. When the literature is examined, it is seen that the nutrition and lifestyle habits of individuals have changed during the pandemic process, similar to the results of this study [16]. COVID-19 has increased interest in nutritional supplements, functional foods, and immune-boosting foods [17]. In a similar study, it was observed that 46.1% of individuals consumed herbal medicines and 34.9% of them consumed functional foods during the pandemic to protect themselves from COVID-19 [18]. In a study conducted in Poland, it was stated that the participants' interest in functional food and dietary supplements increased [19]. In this study, a significant increase was observed in functional food, food supplements, immune-boosting foods, and probiotic-prebiotic products compared to the pre-pandemic period.

It has been reported in studies that healthcare workers are mostly conscious of using nutritional support [20]. In this study, health workers, students, and other groups were found to be conscious about nutritional supplements.

Many similar studies show a decrease in physical activity during the quarantine period [21]. In a study conducted by Souza et al., it was found that the physical activity levels of individuals decreased compared to the pre-quarantine period [22]. In addition, changes in physical activity and changes in food consumption affected the body weight of individuals in this process. Most of the studies in the literature show that there is an increase in the body weight of individuals during the pandemic. And they cover more than 30% of the total study population [23]. In the study conducted by Flanagan et al., 27.30% of individuals reported weight gain, while 17.30% reported weight loss [24]. The prevalence of weight gain during the pandemic may increase diseases associated with weight gain [13]. During the pandemic, physical activity levels of individuals decreased compared to the pre-pandemic period. In the post-pandemic period, it was observed that it was lower than before the pandemic and there was a negative trend of physical activity.

As a result, individuals should be made aware of changes in the quality of life and nutritional habits in this process against a possible pandemic. In addition, when the literature was examined, we could not find a

study conducted after the pandemic, although studies evaluating the pre-pandemic and its process were included. However, post-pandemic studies are important to examine the changes in individuals and habits of the pandemic process. Therefore, we think that such studies are needed. The main limitation of this study is that data such as weight and height were related with a self-reported questionnaire. No measurements were taken from individuals before and during the pandemic. This can lead to incorrect reporting of data.

CONCLUSION

It has been observed that individuals have changed their eating habits during the pandemic process, preferred products that strengthen the immune system, and showed more interest in nutritional supplements and functional foods. However, it can be said that after the pandemic, individuals' interest in these foods decreased and they returned to their pre-pandemic diet. In addition, it was observed that physical activity, which decreased during the pandemic process, decreased further in the post-pandemic period. For this reason, despite a possible pandemic situation, individuals should be made aware of their nutritional habits and physical activity and their sustainability should be ensured.

REFERENCES

1. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infect Dis Poverty*. 2020; 9(1): 29.
2. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). *StatPearls*. 2020.
3. Parmet WE, Sinha MS. COVID-19-The law and limits of quarantine. *N Engl J Med*. 2020; 382(15):e28.
4. World Health Organization. Food and nutrition tips during self-quarantine. 2020.
5. Zhang L, Liu Y. Potential interventions for novel coronavirus in China: A systematic review. *J Med Virol*. 2020; 92(5): 479-490.
6. Dilber F, Dilber A. The effect of coronavirus (COVID-19) disease on the nutritional habits of individuals: The case of karaman province. *J Tour Gastron Stud*. 2020; 8(3): 2144-2162.
7. Ito H, Nakasuga K, Ohshima A, Maruyama T, Kaji Y, Harada M, et al. Detection of cardiovascular risk factors

- by indices of obesity obtained from anthropometry and dual-energy X-ray absorptiometry in Japanese individuals. *Int J Obes*. 2003; 27(2): 232–237.
8. Naja F, Hamadeh R. Nutrition amid the COVID-19 pandemic: A multi-level framework for action. *Eur J Clin Nutr*. 2020; 74(8): 1117–1121.
 9. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *Lancet*. 2020; 395(10227): 912–20.
 10. Tang W, Hu T, Hu B, Jin C, Wang G, Xie C, et al. Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students. *J Affect Disord*. 2020; 274: 1–7.
 11. Korkut GD. Evaluation of dietary habits and physical activity status of first and emergency aid students in COVID-19 pandemic. *J Paramed Emerg Heal*. 2020; 1(1): 1–15.
 12. Cesur F, Cengiz H, Vural H. The effect of waist circumference consumption on small dense low-density lipoprotein and other serum lipid parameters in healthy volunteers. *Turkiye Klin J Heal Sci*. 2022; 7(1): 1–8.
 13. Bousquet J, Anto JM, Iaccarino G, Ceballos V, Haahtela T, Anto A, et al. Is diet partly responsible for differences in COVID-19 death rates between and within countries? *Clin Transl Allergy*. 2021; 10(1): 1–10.
 14. Sandalçı B, Uyaroğlu OA, Sain G, Şen G. The role, significance and recommendations of chronic diseases in COVID-19. *Flora J Infect Dis Clin Microbiol*. 2020; 25(2): 132–138.
 15. Kamarlı AH, Seremet N, Karacı Ermumcu MS. Increased use of dietary supplements and herbal products in adults during COVID-19: A cross-sectional study. *Turkiye Klin J Heal Sci*. 2022; 7(1): 29–35.
 16. Balanzá-Martínez V, Kapczinski F, de Azevedo CT, Atienza-Carbonell B, Josa AR, Mota JC, et al. The assessment of lifestyle changes during the COVID-19 pandemic using a multidimensional scale. *Rev Psiquiatr Salud Ment* 2021; 14(1): 16–26.
 17. Aysin E, Urhan M. Dramatic increase in dietary supplement use during COVID-19. *Curr Dev Nutr*. 2021; 5(Supplement_2):207.
 18. Wróbel K, Milewska AJ, Marczak M, Kozłowski R. The impact of the COVID-19 pandemic on the composition of dietary supplements and functional foods notified in Poland. *Int J Environ Res Public Health*. 2021; 18(22): 11751.
 19. Doğan G, Özyildirim E, Yabancı Ayhan N. Supplementation use and diet changes during COVID-19 pandemic according to anxiety level and Mediterranean diet adherence. *Clin Nutr Espen*. 2023; 54: 117–129.
 20. Demirel G, Kılıçkalkan B, Takak MK. COVID-19 Examining Adults' Use of Nutritional Supplements During the COVID-19 Pandemic. *Genel Tıp Derg*. 2021; 31(4): 430–9.
 21. Puścian-Jakubik A, Bielecka J, Grabia M, Mielech A, Markiewicz-żukowska R, Mielcarek K, et al. Consumption of food supplements during the three COVID-19 waves in Poland-focus on zinc and vitamin D. *Nutrients*. 2021; 13(10): 3361.
 22. Souza TCM, Oliveira LA, Daniel MM, Ferreira LG, Della Lucia CM, Liboredo JC, et al. Lifestyle and eating habits before and during COVID-19 quarantine in Brazil. *Public Health Nutr*. 2022; 25(1): 65–75.
 23. Cheikh Ismail L, Osaili TM, Mohamad MN, Al Marzouqi A, Jarrar AH, Zampelas A, et al. Assessment of eating habits and lifestyle during the coronavirus 2019 pandemic in the Middle East and North Africa region: A cross-sectional study. *Br J Nutr*. 2021; 126(5): 757–766.
 24. Flanagan EW, Beyl RA, Fearnbach SN, Altazan AD, Martin CK, Redman LM. The Impact of COVID-19 stay-at-home orders on health behaviors in adults. *Obesity*. 2021; 29(2): 438–445.