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No social distancing from food: How the COVID-19 pandemic shaped student food-related activities in the Western Balkans

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Abstract

Background: The COVID-19 pandemic has influenced food preparation and consumption habits, as well as food wastage. The pandemic also affected the lives of university students worldwide; their learning and living environments changed, influencing their eating habits. **Aim:** The purpose of this study was to evaluate the repercussions of the COVID-19 pandemic on students' food-related activities in four countries in the Western Balkans: Bosnia and Herzegovina, Serbia, North Macedonia, and Montenegro. **Methods:** The research draws upon an online survey gathered through the SurveyMonkey platform in four Balkan countries—viz. Bosnia and Herzegovina, Serbia, North Macedonia, and Montenegro—and used a structured questionnaire. The information was collected during the second wave of COVID-19 in October–November 2020. A total of 1658 valid responses were received. Descriptive statistics and non-parametric tests were used to analyze the survey findings. **Results:** The research results suggest that the pandemic influenced students' food purchase habits, diets, and food-related behaviors and practices such as food preparation, cooking, and food waste management at the household level. In particular, students have been eating healthier and shopping less frequently during the pandemic. Meanwhile, the pandemic improved their attitude toward food wastage. **Conclusion:** This study is the first to examine how students in the Balkan region perceive the impact of the COVID-19 pandemic on their eating habits, laying the groundwork for future studies into the disease's consequences. This and other studies will assist in preparing students and education institutions for future calamities and pandemics. The findings will also help develop evidence-based postpandemic recovery options targeting youth and students in the Western Balkans.

Keywords

Coronavirus, food procurement, food preparation, food practices, diets, food waste, Bosnia, Serbia, North Macedonia, Montenegro

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Introduction

The COVID-19 pandemic had not only a tremendous effect on health systems but also harmed socio-economic development and people's lives globally (United Nations, 2020). Indeed, during the first wave of the pandemic, mobility restrictions, social distancing measures, and constant societal panic resulted in substantial lifestyle changes and damaged physical and psychological welfare on a global scale (Lamy et al., 2022).

Furthermore, survival psychology implies that individuals may suffer behavioral changes due to unique conditions such as natural catastrophes and health issues. These behavioral alterations may impact food intake attitudes and behaviors (Loxton et al., 2020). Indeed, a growing body of research suggests that COVID-19 has affected food systems (El Bilali, et al., 2021; Savary et al., 2020), with implications for food and nutrition security (Devereux et al., 2020; One Planet Network, 2020; Pérez-Escamilla et al., 2020; UNSCN, 2020a).

Further, the pandemic has had significant repercussions on a variety of food preparation and consumption habits, including food safety awareness, hygiene attitudes, shopping behavior, food waste, etc. (Ben Hassenet al., 2021; Berjan et al., 2022; El Bilali, et al., 2021; El Bilali, et al., 2021; Osaili et al., 2021; Shimpo et al., 2022).

Firstly, shopping practices have adjusted since shopping food in person poses a risk of infection (Hansen, 2022; O'Meara et al., 2022). Consumers shopped less often and paid more each trip to restrict store visits, reducing their COVID-19 risk (Cranfield, 2020). Additionally, motivated by a willingness to practice physical distancing and due to mobility limitations, people turned to online food shopping. Since the pandemic began, online grocery sales have soared (Accenture, 2020; Deloitte, 2020). Secondly, at the beginning of the pandemic, limited understanding of the virus and its potential severity led to panic buying and stockpiling. After disclosing their first coronavirus cases, several countries panic-bought nonperishable foods (e.g., wheat, pasta, noodles, packaged meals, and rice) (Ben Hassenet al., 2021). Thirdly, losing regular routines intensified anxiety and compromised a healthy diet due to lockdowns and quarantines. Indeed, COVID-19 altered people's dietary habits and nutrition consistency at the individual, family, and national levels, leading to lower nutritional and health status (e.g., all types of malnutrition—undernutrition, micronutrient deficiencies, and over-nutrition (cf. overweight/obesity) as well as food-related noncommunicable diseases increased worldwide) (Mignogna et al., 2022). Meanwhile, many consumers throughout the globe have had to reconsider their lifestyles and become more conscious of their diet. Many people were concerned about eating correctly to strengthen their immune systems to resist COVID-19 (Ben Hassen and El Bilali, 2022). Finally, globally, more consumers are preparing their own meals, and exploring new recipes. COVID-19 improved cooking abilities. With restaurants and coffee shops closing, consumers were compelled to eat at home for the majority of their meals; as a result, family meals and cooking became new pastimes (Philippe et al., 2022).

Furthermore, some sociodemographic factors such as gender, age, and occupation influenced these behaviors. Indeed, numerous studies have shown that the COVID-19 pandemic had a more significant impact on women than men (Agarwal, 2020, 2021; Croda and Grossbard, 2021; Ramakumar and Eapen, 2021; Wenham et al., 2020). During the pandemic, women in several countries were less likely to continue shopping as usual (Ben Hassen et al., 2022; Georgiadou et al., 2021). Moreover, during the pandemic, women stockpiled more food than men in many countries such as Serbia (Ben Hassen et al., 2021). Age also affects pandemic food shopping patterns. Using food delivery apps to buy ready-made meals is age dependent. According to various research, young people are more prone to order food delivery (Figliozzi and Unnikrishnan, 2021). In addition, older people shop less frequently and buy more each time to limit COVID-19 exposure. They also stocked more food because they were concerned about their families and futures (Elisabeth et al., 2021).

Simultaneously, the pandemic also affected the lives of university students worldwide. Their learning and living environments changed (Shaun et al., 2021). As a result, millions of students worldwide had to modify their daily routines and eating habits when university and college campuses closed in March 2020 (Powell et al., 2021). Further, they are more prone to food insecurity and eating unhealthily than the general population. A healthy diet may be difficult for college students (DeBate et al., 2021). The situation is significantly worse for those who have lost jobs or experienced other work changes. Online learning and limited sociability may also generate adjustment anxiety and lockdown stress. Students may be prone to weight gain, dietary and lifestyle changes, and other adverse impacts due to disordered eating, financial instability, and other stressors during a pandemic (Palmer et al., 2021).

Recent research shows that students' eating habits altered considerably and frequently negatively throughout the pandemic. Many students reported changing their diets, eating habits, and increasing snacking. Increased leisure time also increased boredom and eating for some students (Flaudias et al., 2020; Powell et al., 2021). Additionally, some studies have shown that students had increased rates of food poverty during the COVID-19 pandemic. Furthermore, students who had lost their jobs or had other work changes were more likely to be food insecure (Soldavini et al., 2021). However, results are likely to be affected and moderated by the food environments and contexts in which the students live and change presumably from one region to another. In particular, it is unclear how these impacts differ between developed and developing countries, such as Western Balkans.

The Western Balkans (viz. Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia) have achieved noticeable socio-economic development over the past two decades. The region has 17.6 million people, a gross domestic product of 100 billion euros, and is

now fully integrated into the European Union (OECD, 2021). According to the Johns Hopkins University (Johns Hopkins Coronavirus Resource Center, 2022), from the beginning of the pandemic until April 2022, Balkan nations were in the top 10 in COVID-19 mortality per 1000 persons, and infections were increasing in the area. The COVID-19 pandemic threatens already-stressed healthcare systems, which lack funds, equipment, and qualified medical personnel due to mass migration to Western European countries (Galgóczi and Calvin, 2020). Additionally, COVID-19 had a devastating impact on the countries of the Western Balkans, resulting in significant recessions in 2020 (OECD, 2021). Furthermore, in times of closures of schools and universities, insufficient or inadequate digital learning technology and instructors' digital abilities offer significant hurdles to successful student learning (OECD, 2020).

In various Balkan countries, several researches have already been carried out on the impact of the COVID-19 pandemic on dietary habits, food buying, and food waste, including Bosnia and Herzegovina (Ben Hassen et al., 2021), Serbia (Ben Hassen et al., 2021; Berjan et al., 2022; Marinković and Lazarević, 2021), and North Macedonia (Bogevska et al., 2021). Although there have been some cross-sectional surveys, most of these studies have focused on the broad adult population. Furthermore, most existing studies on students during the COVID-19 pandemic have focused on their experiences with online learning during the pandemic and how these changes have affected them (Dautbašić and Bećirović, 2022); student interaction in online learning sessions (Marković Krstić and Milošević Radulović, 2021), students reported stress and psychological responses (Kostić et al., 2021), and knowledge, behaviors, and fear of COVID-19 among students (Terzic-Supic et al., 2021). Consequently, no research conducted in the Western Balkans has specifically examined the behaviors associated with food among university students during the COVID-19 pandemic. Our study primarily aims to fill this research gap, which has arisen as a direct result of the scarcity of academic studies on this issue.

We adopted the definition of Grunert et al. (2021) for "food-related behaviors" and we include all aspects of the meal supply chain, including shopping, selecting items, preparing meals as well as consuming and disposing of waste. In particular, this article aims to evaluate the influence of COVID-19 on students' food-related behaviors such as cooking, diet, food waste management, and food shopping, in four Western Balkan countries: Bosnia and Herzegovina, Serbia, North Macedonia, and Montenegro. After providing an overview of the research methodology in the "Materials and methods" esction, we will present the study findings in the "Results" section 3, debate them, and draw major conclusions in "Discussion and conclusions" section.

Materials and methods

The research draws upon an online survey performed in four Balkan countries—viz. Bosnia and Herzegovina, Serbia, North Macedonia, and Montenegro—and used a structured questionnaire to collect data in local languages. The survey was part of the "Consumer Agency, Food Consumption Behavior, and the Novel Coronavirus (COVID-19) Outbreak" international research project promoted by the Food Industry Research and Education Center at the Western Michigan University. The international research included teams from China, Germany, the Netherlands, Qatar, Turkey, the United Kingdom, and the United States (Western Michigan University, 2020).

The questionnaire used in the online surveys was informed by the Food Consumption Changes 2020 survey of theWestern Michigan University (2020) and the COVID-19 Survey of the United Nations System Standing Committee on Nutrition (UNSCN, 2020b). The first draft of the questionnaire was created in English; subsequent versions were translated into each of the other languages by committees composed of local researchers and native speakers of local languages, as Sperber (2004) had suggested. Within each committee, at least two researchers with experience in survey design and expertise in food science worked independently or in tandem to generate a consensus questionnaire. Following that, the other team members double-checked it to verify that it was accurate.

The data was gathered through the SurveyMonkey platform during the second wave of COVID-19 in October–November 2020. The study was aimed at the general adult population in these countries (defined as those over the age of 18). Furthermore, the study was based on the snowball sampling approach. We utilized a nonprobability sampling approach since the survey respondents were randomly chosen and voluntarily participated.

The questionnaire had 25 questions (multiple-choice and one-option), divided into three sections. In the first section, 10 sociodemographic questions were asked (e.g., country, age, education level, gender, revenue, etc.). The second section included 13 questions about their eating habits, practices, and attitudes (e.g., food shopping habits, food activities and diets, food waste, etc.). Finally, they were asked two questions about their feelings during the pandemic (Appendix A). For multiple-choice sociodemographic questions, response options depended on the question's nature. For example, for question 8: "What is your household composition?", response options were as follows: single person/living with parents/married with children/ married without children/extended family: grandparents, children, and grandchildren/shared household, nonrelated. For some multiple-choice questions, a Likert scale was used and response options were: never = 0; first time = 1; much less = 2; slightly less = 3; about the same = 4; moderately more = 5; and much more = 6. For some other multiple-choice questions, response options were 5-point Likert scale: 1 (not at all), 2, 3, 4, 5 (very much).

The questionnaire was meticulously developed to minimize the risk of standard procedure variation and the possibility of respondents misinterpreting the questions. Before

it was distributed, the questionnaire underwent two rounds of validation: an expert review and a pilot test (Hawkins et al., 2019; Taherdoost, 2016). Firstly, a panel of experts performed a qualitative substance for content validity to enhance the study's accuracy. They rigorously analyzed the questionnaire to ensure that the questions accurately reflected the study objectives. Indeed, we requested a panel of professional members to assess our instruments, decide the appropriateness of each item, and make ideas for instrument development and improvement. Based on their input, we modified the questionnaire (i.e., the phrasing of multiple-answer options and wording of instrument directives). Irrelevant content was eliminated on expert advice, and the remaining elements were revised to be more factual and precise. Secondly, a pilot test with 20 participants in each country was undertaken to confirm that the data was valid. The feedback was utilized to fine-tune the survey before it was distributed. Furthermore, the same questionnaire was used successfully in previous surveys in Europe, such as in Russia (Ben Hassen, et al., 2021), Bosnia and Herzegovina (Ben Hassen, et al., 2021), Serbia (Ben Hassen et al., 2021), and in the North Africa region such as Egypt, Morocco, and Tunisia (Ben Hassen et al., 2022; El Bilali, et al., 2021), which confirms its suitability and reliability.

There were 1658 valid responses. The survey findings were analyzed with the software SPSS (Statistical Package for Social Sciences) version 25.0. Means, variation ratios, frequencies, and percentages were calculated for descriptive data. Different answers were evaluated to ascertain the percentages of responses and cases. Non-parametric tests were required for data analysis because of the presence of nominal and ordinal variables. In addition, the chi-square test and, where appropriate, Fisher's exact tests were used to examine the relationship between the variables and participants' sociodemographic features (age, gender, income, etc.). For all tests, the p-value for statistical significance was set at 0.05.

Results

Sociodemographic features of the study cohort

According to the research findings, as shown in Table 1, 73% of the cohort are female, 75.2% live with their parents, and 20.9% live with their extended family. Regarding age, 86.2% of the participants were between the ages of 18 and 25, with only 13.4% being between the ages of 25 and 35.

Student's diet during the COVID-19 pandemic

The study results confirmed that students' diets changed after the COVID-19 outbreak in the Balkans. Indeed, 24% ate more healthy meals, 28.53% ate more fruits and vegetables, and 26.88% drank more water. Meanwhile, meat consumption has remained stable, as shown by the fact that the vast majority of survey respondents (87%) have not changed their meat-consuming habits. Further findings revealed that 32.06% of the cohort consumed less unhealthy meals (e.g., fast food), 20.61% had fewer unhealthy snacks, 16.14% ate less canned food, and 11.36% ate less packaged frozen foods (Table 2).

Table 1. Sociodemographic features of the survey participants.

Variable		Percentage
Gender	Female	73
	Male	27
Living location	Urban region or city	69.2
	Rural area or village	30.8
Age (years)	18–25	86.2
	25–35	13.4
	35–45	0.4
Household composition	Single person	2.4
	Living with parents	75.2
	Married without children	9
	Extended family	20.9
	Nonrelated shared household	1.5

Students' food-related activities during the COVID-19 pandemic

As seen in Table 3, in the Balkans, students' food-related activities were altered significantly during the pandemic. Firstly, 54.1% ate out less (e.g., at restaurants, cafés, and fastfood restaurants), 26% ordered fewer take-out or fast food with delivery, and 23.6% did not. Secondly, 44% said they ate less often at someone else's house (a friend or family member). On the other hand, 37.8% said they were cooking more, and 33% said they spent much more time in the kitchen. Furthermore, 17.8% said they prepare less easy meals.

Thirdly, during the pandemic, as seen in Table 4, 28% of the respondents reported making fewer supermarket trips than customary, 67.6% reported shopping as usual, and just 4.4% reported shopping more than usual. In terms of purchases made in the aftermath of the COVID-19 outbreak, 13.8% of survey participants said that they had bought more and a lot more than they had before on each visit (including "a lot more" and "more" response choices). Furthermore, 7.2% stated that they purchase less or a lot less than they would normally. However, 79% indicated that they did not change their purchasing habits and continued to shop as usual.

Finally, there has been a change in food consumption habits and attitudes, especially about food waste in the household (Table 5). However, even though 30.25% of the respondents said they stockpiled food, most respondents (97.10%) said they did not throw away more food than they would have done otherwise. Even more impressively, 30.01% said they had decreased their food waste. Another 59% responded that they had become more aware of how much food is thrown away.

Table 2. Changes in students' diet during the COVID-19 pandemic in the Balkans.

Food item	First time	Less	About the same	Much more	Never eat	M	SD
Fruits/vegetables	0.15	2.98	67.87	28.53	0.47	4.35	0.84
Meat	0.15	5.02	86.99	6.27	1.57	3.95	0.72
Healthy foods	0.17	5.01	69.51	23.98	1.33	4.23	0.96
Unhealthy foods (fast food)	0.07	32.06	54.78	7.13	5.96	3.34	1.26
Water	0.16	0.7	71.08	26.88	1.18	4.37	0.95
Candy, cookies, cakes, and pastries	0.07	15.99	65.60	16.69	1.65	3.90	1.05
Healthy snacks	0.39	9.49	72.65	6.34	11.13	3.50	1.39
Unhealthy snacks	0.08	20.61	62.07	10.03	7.21	3.49	1.33
Packaged frozen foods	0.39	10.97	65.13	7.76	15.75	3.34	1.56
Canned food	0.31	16.14	63.71	6.27	13.56	3.21	1.54

M, mean; SD, standard deviation.

Table 3. Changes in food-related activities during the COVID-19 pandemic.

Variable	Total		Never did	First time	Much less	Slightly less	About the same	Moderately more	Much more
	M	SD*							
Eating at home alone	3.74	1.32	7.0	4.0	6.6	3.6	69.5	5.7	7.2
Eating with family members	4.40	9.14	0.4	0.2	1.4	1.9	67.6	9.8	18.8
Eating out (e.g., restaurants/ cafeteria/fast food)	2.61	1.34	12.0	0.1	40.0	14.1	30.6	2.5	0.7
Eating at someone else's place (e.g., family, friends)	2.76	1.40	12.7	0.4	31.2	13.0	40.2	1.6	0.8
Ordering take-away or fast food meals with deliveries	2.72	1.77	23.6	0.6	17.4	8.6	40.7	6.8	2.3
Cooking and preparing food	4.49	1.10	1.7	0.4	0.9	1.1	58.0	15.1	22.7
Spending a lot of time cooking	4.24	1.27	4.3	0.7	2.0	2.3	57.7	16.2	16.8
Making easy meals (e.g., instant foods, frozen foods, etc.)	3.03	1.72	20.1	0.2	10.1	7.7	53.5	5.0	3.4
Eating between meals (e.g., snacks)	3.82	1.40	6.8	0.2	8.3	5.8	57	12.1	9.9

M, mean; SD, standard deviation.

Table 4. Shopping behaviors changes during the COVID-19 pandemic.

		Frequency	Percentage
Change in shopping behavior	I go shopping less than usual	465	28
	I go shopping like I used to	1121	67.6
	I go shopping more than usual	72	4.4
	Total	1658	100
Change in food purchase behavior	I buy a lot less than usual	18	1
	I buy less than usual	102	6.2
	I buy as same as usual	1309	79
	I buy more than usual	184	11.1
	I buy a lot more than usual	45	2.7
	Total	1658	100

As shown in Table 6, among food-related behaviors during COVID-19, respondents mentioned: "cooking and preparing food" (mean = 4.49) and "eating with family members" (mean = 4.40) as the two first changed activities. The research results also demonstrate that the sociodemographics of the individuals were associated with several food-related behaviors and attitudes during the pandemic (Table 6). For instance, dining out (restaurants/cafeterias/ fast food) is strongly associated with gender and income (chi-square test, $p < 0.05$). Similarly, ordering food delivery is connected to gender and income, which is often quite expensive and cost-effective for high-income households.

Cooking and food preparation were also associated with gender. Furthermore, food purchasing habits are connected to gender, and food purchase behavioral changes are associated with income. Indeed, food spending is strongly linked to income level.

Discussion and conclusions

This study examined the early effects of COVID-19 on eating habits and attitudes among Balkan university students. Since the COVID-19 pandemic began, respondents' views on food and health have shifted dramatically. Food-related interactions are evolving rapidly. The findings revealed a wide range of current dietary and eating habits influenced by these trends.

Table 5. Stockpiling and food waste during the COVID-19 pandemic.

Variable	Percentage
Because of the coronavirus (COVID-19), have you stockpiled food and beverages?	
Yes	30.25
No	69.75
Total (%)	100
How has your food waste changed after the COVID-19 outbreak?	
It has become much less	15.20
Less	14.81
Has not changed	68.50
More	1.10
Much more	0.39
Total (%)	
Are you wasting more food than usual?	
Yes	2.90
No	97.10
Total (%)	100
Are you more aware of how much food you waste?	
Yes	59.17
No	40.83
Total (%)	100

First, the data revealed an unexpected COVID-19 benefit: promoting healthy eating habits. Most people improved their diet, limiting unhealthy items like sweets and fast food. They increased their intake of fruits, vegetables, and water. Since the pandemic began in March 2020, consumers have become increasingly concerned about their health and nutrition. Many participants said that they are increasing their intake of healthy foods like fruits and vegetables to help boost their immune systems. A healthy diet is vital, especially when the immune system is attacked (WHO, 2020). Additionally, diet-related diseases like diabetes and obesity are now linked to the severity of COVID-19 disease (iPES Food, 2020). This could be a big step forward in the fight against diet-related noncommunicable diseases in the Balkans (Jakovljevic and Varjacic, 2017). Indeed, Balkan countries have to face several health issues. Chronic noncommunicable diseases (mostly cardiovascular diseases, malignancies, chronic respiratory diseases, and diabetes) are the primary causes of morbidity and mortality. Absenteeism, disability, and premature death are usually avoidable if appropriate interventions are adopted (Jakovljevic and Varjacic, 2017; Marija et al., 2018). Moreover, this is a positive shift for students. Indeed, faced with a lifestyle change as soon as they join university, they often adopt negative and unhealthy lifestyle behaviors, sometimes without realizing it. Globally, many young people, particularly students, participate in such unhealthy lifestyle choices (Dodd et al., 2010). In general, students' eating habits seem to be more prone to weight swings and unhealthy dietary habits (Palmer et al., 2021).

Second, due to the global COVID-19 situation, nonessential businesses such as cafés, restaurants, and bakeries

Table 6. Effects of sociodemographic on food-related behaviors during the COVID-19.

Variable	Total		Gender	Age	Income
	Mean	Standard deviation	$\chi^{2,\,a}$	$\chi^{2,\,a}$	$\chi^{2,\,a}$
Eating at home alone	3.74	1.32	5.93	20.61	9.67
Eating with family members	4.40	9.14	8.58	14.04	32.96
Eating out (e.g., restaurants/cafeteria/fast food)	2.61	1.34	41.82**	11.88	45.78**
Eating at someone else's place (e.g., family, friends)	2.76	1.40	17.69**	8.53	46.09**
Ordering take-away or fast food meals with deliveries	2.72	1.77	17.99**	17.4	46.41**
Cooking and preparing food	4.49	1.10	57.51**	13.72	36.30*
Spending a lot of time cooking	4.24	1.27	60.00**	10.58	41.90**
Making easy meals (e.g., instant foods, frozen foods, etc.)	3.03	1.72	10.25	14.63	45.27**
Eating between meals (e.g., snacks)	3.82	1.40	22.22**	11.25	27.73
Shopping behavior during COVID-19[b]	1.76	0.52	14.29**	3.43	14.39
Change in food purchase behavior[c]	3.08	0.56	1.48	10.59	40.02**

[a]Fisher's exact test value.
[b]Scale: (I go shopping less than usual = 1 to I go shopping less than usual = 3).
[c]Scale: (I buy a lot less than usual = 1 to I buy a lot more than usual = 3).
*p-value < 0.05, **p-value < 0.01.

were forced to close in March 2020. For instance, on March 15, 2020, the Serbian government declared a state of emergency. It implemented many containment measures, such as lockdown, closure of non-essential businesses, school and university closures, and remote work (Šantić and Antić, 2020). Foods prepackaged and ready to eat were reduced, regular meal times were instituted, and family dining became more common. In addition, some consumers are eating less at restaurants and more at home, cooking, and baking more. The same behavior was observed in many countries, such as Qatar, Palestine, Morocco, Egypt, Tunisia, and Russia, where restaurants, coffee shops, and cultural institutions were forced to close; people found alternative ways to pass the time by cooking and eating with their families (Ben Hassen et al., 2020, 2022; Ben Hassen et al., 2021; Ben Hassen et al., 2021). However, even after restaurants reopened in many countries throughout the region in May 2020, many consumers are still afraid of contracting the virus, so they have continued to avoid restaurants and eat more at home.

Further, as revealed in various European countries such as the Czech Republic (Eger et al., 2021), Russia (Ben Hassenet al., 2021), Serbia (Ben Hassen et al., 2021; Marinković and Lazarević, 2021), and the overall Western Balkans region (Končar et al., 2021), COVID-19 has been shown to have an impact on purchasing behaviors and food procurement of the general population including university students. Participants' buying habits have changed because they think grocery shopping is stressful and risky (fear of the virus, anxiety in close proximity to others, long waiting lines in supermarkets, etc.). To reduce the number of store visits and the perceived risk of virus infection, most of them spent more money and bought more products during each visit.

Finally, confinement allowed students to plan ahead. Meals planned ahead of time, shopping lists made, and cabinets and refrigerators inventoried. These habits helped reduce household food waste by preventing unwanted purchases and duplicates from being thrown out. They cooked more because they were stuck at home for 2 months.

This study is the first to examine how students in the Balkans region perceive the impact of the COVID-19 pandemic on their eating habits. It lays the groundwork for future studies into the disease's consequences. The majority of academic papers on the COVID-19 pandemic's impact on food systems and consumption habits have been geographically biased, focusing on Western and Southern Europe, North America, and China (Colafemmina et al., 2020), while developing countries in general and the Balkans region in particular, have been overlooked.

However, certain limitations to the survey technique and tool limit the sample representativeness. Firstly, the sample bias is the most significant limitation of this research. The cohort was chosen randomly and hired voluntarily, mainly through social media. As a self-administered questionnaire, it was completed by volunteers who were not reimbursed for their time. Participants in the study were limited to those personally interested in the topic. The overall student population of the "country" was not accurately reflected in the sample since there was a disproportionately large number of females. In this particular setting, generalizing the findings would be inaccurate. In addition, similar to the general population, students with limited internet access are often underrepresented in online surveys (Spitzer, 2020) and therefore are not represented in this study. Another potential limitation is that the questionnaire was elaborated in English and then translated into local languages, which might have altered the meaning and understanding of some questions, although the final questionnaire version used in the online survey has been checked and validated by local experts. The limitations described above are common in Computer-assisted web interviewing, which is currently employed in surveys regularly (Monzon and Bayart, 2018). Further, as explained above, this study was conducted during the second wave of COVID-19 in October–November 2020. Accordingly, face-to-face interviews were impracticable and/or risky during that period. As a result, online surveys enabled data to be gathered remotely, which was a significant advantage.

Secondly, our food-related behavioral changes assessment was self-reported and point-in-time. However, people's perceptions of food behaviors during the lockdown may be influenced by immediacy bias. Indeed, as Rodgers et al. (2021) pointed out, changes in food-related behaviors were complicated by compliance with general health guidelines in the aftermath of the pandemic, which might have reflected prevailing societal expectations during the pandemic's early months. For instance, since social norms regarding eating affect both food choice and intake (Higgs, 2015), persons who are influenced by these norms about eating healthy may have impacted the outcomes of this research.

Authors' contributions

TBH and HEB contributed towards conceptualization, writing—original draft preparation, and project administration. TBH, HEB, and MSA were involved in methodology and writing—review and editing. MSA was involved in software, validation, and data curation. TBH, HEB, MSA, and SB contributed towards formal analysis; and investigation was by AR, DC, ZB, AD, and ZV. All authors have read and agreed to the published version of the manuscript.

Availability of data and materials

The data used during the present investigation are available upon request to the corresponding author.

Declaration of conflicting interests

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

Ethical approval

The survey was conducted in accordance with the Helsinki Declaration and approved by the Western Michigan University Human Subjects Institutional Review Board (HSIRB). The survey was voluntary. All participants were informed of the research's objective and context before giving their digital informed consent regarding privacy and data management policies.

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Appendix A: Questionnaire (English version).

Section 1: Sociodemographics

1 Country
2 Gender:
- Male
- Female

3 Where do you live?
- Urban region
- Rural area

4 Age
- 18–24
- 25–34
- 35–44
- 45–54
- 55 and over

5 Level of education
- No formal schooling
- Primary school
- Preparatory level
- Secondary school
- University degree
- Higher degree (MSc or PhD)

6 How would you describe your household income compared to other households in your country?
- Much lower than most other households
- Slightly lower than most other households
- About the same as most other households
- Slightly higher than other households
- Much higher than other households

7 Occupation
- In paid work (full time or part time)
- Student
- Unemployed and looking for work
- Home duties
- Retired/age pensioner

8 What is your household composition?

(continued)

Appendix A: (continued)

Section 1: Sociodemographics

- Single person
- Living with parents
- Married with children
- Married without children
- Extended family: grandparents, children, grandchildren, etc.
- Shared household, nonrelated

9 How many people are currently living in your home?

- Children 18 years or younger
- Adults (including yourself)
- Total (including yourself)

10 Have you lost your job or had any pay reduction in your salary due to COVID-19? Yes/No

Section 2: Food buying and consumption behavior

11 Below is a list of food-related behaviors. Please indicate how that behavior has changed for you as a result of the coronavirus (COVID-19) becoming serious in your country (7-point response scale: never = 0; first time = 1; much less = 2; slightly less = 3; about the same = 4; moderately more = 5; much more = 6.)

- Buying local food (produced in your country)
- Ordering groceries online
- Buying food in person from a large supermarket
- Buying food in person from a small supermarket or grocery store
- Having meals delivered directly to my home

12 What has changed in your shopping behavior during the outbreak of COVID-19 and lockdown?

- I go shopping less than usual
- I go shopping like I used to
- I go shopping more than usual

13 What has changed in the extent of your purchase during the outbreak of COVID-19 and lockdown?

- I buy a lot more than usual
- I buy more than usual
- I buy as same as usual
- I buy less than usual
- I buy a lot less than usual

14 Since the coronavirus (COVID-19) became serious in your country, have you eaten or drunk more or less of the following foods? (7-point response scale)

- Fruits/vegetables
- Meat
- Healthy food
- Unhealthy food (fast food)
- Water
- Can
- Candy, Cookies, cakes, and pastries
- Healthy snacks
- Unhealthy snacks
- Packaged frozen foods
- Canned food

15 Since the coronavirus (COVID-19) became serious in your country, have you done more or less of the following food related activities than you used to? (7-point response scale)

- Eating at home alone
- Eating with family members
- Eating out (e.g., restaurants/cafeteria/fast food)
- Eating at someone else's place (e.g., family, friends)
- Ordering take-away or fast food meals with deliveries
- Cooking and preparing food
- Spending a lot of time cooking
- Making easy meals (e.g., instant foods, etc.)
- Eating between meals (e.g., snacks)

16 Have you stocked up on food and beverages because of the coronavirus (COVID-19)? Yes/No

17 What type of food you stocked up the most during the outbreak of COVID-19 and lockdown? (Please select all that apply)

- Cereals and their products (bread, rice, pasta, flour, etc.)

(continued)

Appendix A: (continued)

Section 1: Sociodemographics

- Roots and tubers (potatoes, etc.)
- Legumes (e.g., peas, chickpeas)
- Sugar
- Oil
- Fruits and vegetables
- Meat and meat products
- Fish and seafood
- Milk and dairy products
- Canned food
- None

18 Since the COVID-19 outbreak, did you notice that any of these items is less available? (Please select all that apply)

- Cereals and products (bread, rice, pasta, flour, etc.)
- Roots and tubers (potatoes, etc.)
- Legumes (e.g., peas, chickpeas)
- Sugar
- Oil
- Fruits and vegetables
- Meat and meat products
- Fish and seafood
- Milk and dairy products
- Canned food
- None

19 Since the COVID-19 outbreak, did you notice any price increase for any of these items? (Please select all that apply)

- Cereals and products (bread, rice, pasta, flour, etc.)
- Roots and tubers (potatoes, etc.)
- Legumes (e.g., peas, chickpeas)
- Sugar
- Oil
- Fruits and vegetables
- Meat and meat products
- Fish and seafood
- Milk and dairy products
- Canned food
- None

20 How does stocking up on items make you feel? (5-point response scale: 1 (not at all),…,5 (very much))

- Stocking up on items makes me feel less anxious
- Stocking up on items makes me feel more secure
- Stocking up on items comforts me
- Stocking up on items gives me a sense of control

21 Please indicate how concerned you have been since COVID-19 became serious in your country about the following food-related issues? 5-point response scale: 1 (not at all),…,5 (very much))

- Obtaining enough food
- Obtaining a variety of food
- Access to healthy and safe food
- Food prices rising
- Food spreading COVID-19

22 Regarding changes in your food-related behaviors since the outbreak of COVID-19: Yes/No

- Do you buy more food out of fear or anxiety?
- Do you eat more food out of fear, anxiety, or boredom?
- Are you wasting more food than usual?
- Are you more aware of how much food you waste?

23 How has your food wastage changed during the outbreak of COVID-19 and lockdown?

- It has become much less
- Less
- Has not changed
- More
- Much more

(continued)

Appendix A: (continued)

Section 1: Sociodemographics

Section 3: Emotions

24 Please indicate your negative feelings since the onset of COVID-19 (5-point response scale: 1 (not at all),…,5 (very much))

- Nervous
- Worried
- Depressed
- Sad
- Scared
- Bored

25 Please indicate your positive feelings since the onset of COVID-19 (5-point response scale: 1 (not at all),…, 5 (very much))

- Calm
- Optimistic
- Excited
- Happy