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Original Research Article

Shifts in Lifestyle and Dietary Patterns during the COVID-19 Pandemic: A Comparative Study of Habit Changes and Health Outcomes

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Summary

Background: The COVID-19 pandemic has significantly impacted daily life, including lifestyle and dietary habits. This study investigates these changes to understand their effects on health behavior patterns.

Objective: To examine the alterations in smoking habits, physical activity, sleep patterns, dietary behaviors, and supplement use during the COVID-19 pandemic.

Materials and Methods: A cross-sectional survey was conducted with 400 participants to assess their lifestyle and dietary habits before and during the COVID-19 pandemic. Data were analyzed using SPSS 26 IBM, with statistical significance determined through chi-square tests, McNemar tests, and Mann-Whitney U tests.

Results: The study found a decrease in heavy smoking from 11 % to 9.8 % and a significant rise in sedentary behavior from 44.3 % to 55.5 % ($p < 0.001$). Sleep patterns shifted, with a reduction in inadequate sleep and increased excessive sleep. Dietary changes included a rise in supplement use from 25.3 % to 41.8 % ($p < 0.001$) and increased appetite, leading to weight gain (48.3 %). Adherence to the Mediterranean diet showed variability, with some aspects being less adhered to during the pandemic.

Conclusions: The COVID-19 pandemic has led to significant changes in lifestyle and dietary habits, including increased sedentary behavior, altered sleep patterns, and shifts in dietary practices. Public health interventions should focus on promoting physical activity, balanced nutrition, and appropriate supplement use. Future research should explore the long-term impacts of these changes and potential strategies for mitigating negative health outcomes.

Keywords: COVID-19, lifestyle changes, dietary habits, Mediterranean diet, dietary supplements.

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Изменения в образе жизни и питании во время пандемии COVID-19: сравнительное исследование изменений привычек и последствий для здоровья

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Резюме

Введение: Пандемия COVID-19 существенно повлияла на повседневную жизнь, включая образ жизни и пищевые привычки. Данное исследование рассматривает эти изменения для понимания их влияния на модели поведения, связанные со здоровьем.

Цель: Изучить изменения в привычках курения, физической активности, режиме сна, пищевом поведении и приеме пищевых добавок во время пандемии COVID-19.

Материалы и методы: Проведено поперечное исследование с участием 400 респондентов для оценки их образа жизни и пищевых привычек до и во время пандемии COVID-19. Данные анализировались с помощью пакета программ SPSS 26 IBM, статистическая значимость определялась с помощью критерия хи-квадрат, критерия Макнемара и U-критерия Манна-Уитни.

Результаты: Установлено снижение доли респондентов с высокой интенсивностью курения с 11 % до 9,8 % и значительное увеличение доли лиц, ведущих малоподвижный образ жизни, с 44,3 % до 55,5 % ($p < 0,001$). Изменился режим сна: сократился недостаток и увеличился избыток сна. Изменения в питании характеризовались ростом доли респондентов, принимающих пищевые добавки, с 25,3 % до 41,8 % ($p < 0,001$) и повышением аппетита, что привело к увеличению веса у 48,3 % участников. Респонденты не всегда придерживались средиземноморской диеты, причём во время пандемии некоторые её аспекты соблюдались менее строго.

Выводы: Пандемия COVID-19 привела к значительным изменениям образа жизни и пищевых привычек, включая рост числа людей, ведущих малоподвижный образ жизни, изменение режима сна и рациона питания. Меры общественного здравоохранения должны быть направлены на поощрение физической активности, сбалансированного питания и рационального использования пищевых добавок. В будущих исследованиях необходимо изучить долгосрочные последствия этих изменений и потенциальные стратегии смягчения негативных последствий для здоровья.

Ключевые слова: COVID-19, изменение образа жизни, пищевые привычки, средиземноморская диета, пищевые добавки.

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Introduction

In early 2020, the COVID-19 pandemic posed an unprecedented threat to public health. In March 2020, most European countries implemented their first lockdown. Over the following two years, additional lockdowns and various restrictions were imposed based on regional infection rates and policies [1]. The quarantine process and its negative psychological effects contributed to restricted physical activity, increased sedentary behavior, unhealthy food and beverage consumption, and changes in dietary habits [2]. These changes have been shown to accelerate the development of diseases such as obesity, diabetes, cardiovascular disease, and cancer, as well as to become mortality risk factors for COVID-19 patients [3].

Furthermore, psychological and emotional responses to the COVID-19 outbreak might elevate the risk of developing dysfunctional eating behaviors [4]. It is well established that experiencing negative emotions can lead to overeating, commonly referred to as "emotional eating" [5]. In response to the negative effects of self-isolation, individuals may increasingly seek reward and gratification through food consumption, potentially overriding natural signals of hunger and satiety [6]. Lifestyle changes resulting from containment measures might lead to increased sedentary behaviors and modifications in smoking and sleeping habits [7].

Lifestyle behaviors, including physical activity, dietary habits, and supplement use, are critical in maintaining health and preventing chronic diseases. The Mediterranean diet (MD), characterized by high consumption of vegetables, fruits, whole grains, and olive oil, is widely recognized for its health benefits, including reduced risk of cardiovascular diseases and improved metabolic health [8]. Greater adherence to a Mediterranean-style diet has been linked to a reduced risk of respiratory infections and lower mortality rates related to COVID-19 [9].

The COVID-19 pandemic introduced unprecedented challenges that potentially altered dietary patterns and lifestyle behaviors. Reports suggest increases in sedentary behavior, changes in eating habits, and shifts in supplement use during this period. Given these potential changes, it is essential to assess how adherence to dietary guidelines, such as the MD, has been affected during the pandemic [10, 11].

Previous studies have investigated various aspects of lifestyle changes during the pandemic; however, comprehensive data focusing on adherence to the Mediterranean diet and detailed lifestyle behavior changes, especially in the Turkish population, are limited. There is a need to fill this gap, particularly by assessing how specific dietary patterns and lifestyle behaviors are affected by the pandemic in different populations. The main **objective** of the study is to investigate and analyze changes in eating behavior and lifestyle habits during the quarantine of the COVID-19 pandemic among the Turkish population and sex-specific changes in adherence to MD.

We hypothesize that the COVID-19 pandemic has decreased adherence to the Mediterranean diet and increased sedentary behavior. Additionally, we expect to observe changes in smoking habits, sleep duration, and supplement use during the pandemic.

Materials and Methods

Study Design and Participants

This cross-sectional study investigated changes in lifestyle and dietary habits during the COVID-19 pandemic. The sample size was determined as a minimum of 384 with a 5 % margin of error at a 95 % confidence interval [12], and reached 400 participants in the final. The inclusion criteria were adults aged 18 and older with no severe chronic illnesses or conditions that might affect their lifestyle or dietary habits. The survey was conducted among the Turkish population between November 25 and December 25, 2020, through an online platform accessible via an internet-enabled device. It was disseminated using institutional and private social networks and institutional mailing lists. While this sampling method does not allow for control over population parameters, as in convenience sampling, it was highly effective in achieving the research objectives. The online format facilitated widespread survey distribution during territorial restrictions due to the pandemic. Additionally, the latest annual Turkish internet usage report indicates that internet penetration was 74 % in July 2020, with 94 % of users aged 16 to 64 accessing the internet via smartphones and 99 % of them visiting or using social networks or messaging services [13].

Data Collection

Data were collected through a structured questionnaire distributed online to participants. The questionnaire assessed sociodemographic and anthropometric characteristics, adherence to the Mediterranean diet, and lifestyle habits before and during the COVID-19 pandemic. In the first section of the survey, sociodemographic data (age, sex, employment status, etc.) and self-reported anthropometric data (height and weight) were collected. BMI was calculated based on self-reported height and weight, and participants were categorized into underweight, normal weight, overweight, and various classes of obesity based on standard BMI ranges [14].

In the second section, the Mediterranean Diet Adherence Screener (MEDAS) developed by Schröder et al [15] in 2011 and validated in Turkish by Pehlivanoğlu et al [16] was utilized.

The third section of the questionnaire included questions about food preferences, physical activity, sleep status, and dietary supplement use before and during COVID-19. The questions about dietary habits and physical activity were adapted from the previous study [17].

Mediterranean Diet Adherence

Adherence to the Mediterranean diet was evaluated using the MEDAS. The scale consists of 14 questions and includes inquiries about the main type of oil used in meals, the daily amount of olive oil consumed, servings of fruits and vegetables, consumption of margarine-butter and red meat, as well as the weekly intake of wine, legumes, fish and seafood, nuts, shelled nuts, pastries, and olive oil-based tomato sauce. For each question, 1 or 0 points are given based on the amount

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consumed, and the total score is then calculated. When participants are classified based on the score obtained from the scale, 0–5 points indicate low adherence, 6–9 points indicate moderate adherence, and a score of 10 or above indicates high MD adherence [16].

Lifestyle and Dietary Habit Assessment

Lifestyle habits were evaluated using questions related to smoking status, sleep duration, physical activity levels, changes in eating behavior, appetite, weight, and supplement use. To determine smoking status, participants were classified as non-smokers, light smokers (defined as those who smoke less than five cigarettes per day), moderate smokers (defined as those who smoke five to ten cigarettes per day), or heavy smokers (defined as those who smoke more than ten cigarettes per day). Concerning sleep duration, participants indicated whether their average sleep duration was inadequate (less than seven hours), optimal (seven to nine hours), or excessive (more than nine hours). Activity levels were classified as sedentary (no sports), low (one to two times a week), moderate (three to four times a week), or high (more than five times a week). Participants reported whether their eating behavior had improved, worsened, or remained unchanged during the pandemic.

Statistical Analysis

Descriptive statistics were used to summarize the sociodemographic characteristics and nutritional status of the participants. Continuous variables like age and BMI were reported as means with standard deviations. Categorical variables, including nutritional status, region, and education level, were expressed as frequencies and percentages. Differences between sexes for these categorical variables were assessed using chi-square and Fisher's exact tests where appropriate. Continuous variables were compared between sexes using independent samples **t**-tests or Mann-Whitney *U* tests, depending on the data distribution.

To evaluate changes in lifestyle habits before and during the COVID-19 pandemic, paired comparisons were performed using McNemar's test for dichotomous variables. Changes in smoking habits, sleep duration, physical activity levels, eating behavior, appetite, weight changes, and supplement use were analyzed in this context. The McNemar test assessed significant differences in these habits before and during the pandemic.

Differences were tested using chi-square tests for categorical variables and Mann-Whitney *U* tests for continuous variables to analyze MEDAS scores and adherence to the MD by sex. The MEDAS score was compared between sexes to determine differences in diet adherence. The MEDAS score was reported as the mean with interquartile range (IQR).

All statistical analyses were conducted using SPSS 26 (IBM Corp). Statistical significance was set at $p < 0.05$ for all tests.

Results

Sociodemographic Characteristics and Nutritional Status of the Participants

The study sample comprised 400 participants, including 290 women (72.5 %) and 110 men (27.5 %) (Table 1). The mean age was 29.0 ± 9.3 years, with women being slightly younger (28.5 ± 9.5 years) than men (30.5 ± 8.7 years). The mean BMI was 23.9 ± 4.2 kg/m^2, with women having a lower mean BMI (23.2 ± 4.2 kg/m^2) than men (25.7 ± 3.7 kg/m^2). Nutritional status differed significantly by sex; a higher percentage of women were categorized as having normal weight (66.2 %) compared to men (43.6 %), while men showed higher proportions of overweight and obesity ($p < 0.0001$). The regional distribution, age categories, and education levels varied significantly between sexes ($p = 0.02$ for location; $p < 0.0001$ for age category; $p = 0.115$ for levels of education). Occupational status also revealed significant differences, with a higher rate of unemployment among women (16.2 %) compared to men (4.5 %) ($p = 0.001$) (Table 1).

Impact of the COVID-19 Pandemic on Lifestyle Habits

During the COVID-19 pandemic, several lifestyle habits changed significantly (Table 2). Heavy smokers decreased from 11 % to 9.8 % ($p = 0.003$), as confirmed by the McNemar's test (McNemar value = 22.55, $p < 0.001$). The proportion of participants reporting less than 7 hours of sleep decreased from 33 % to 26 %, while of those sleeping more than 9 hours increased significantly from 5.5 % to 14 % (McNemar value = 27.43, $p < 0.001$). Sedentary lifestyles increased from 44.3 % to 55.5 %, and 21 % of participants self-reported worsened eating behavior during the pandemic. Additionally, 53.8 % of the participants experienced increased appetite, and weight gain was observed in 48.3 %. Supplement use rose substantially from 25.3 % to 41.8 % during the pandemic ($p < 0.001$).

Figure 1 shows fluctuations in food consumption patterns during the COVID-19 pandemic. Notably, there was an increase in the consumption of coffee, tea, herbal tea, nuts, fruits, fresh vegetables, eggs, and dairy products. Conversely, a decline was observed in the consumption of takeout foods, packaged foods, sweetened and carbonated beverages, processed meat products, and alcoholic beverages. These changes reflect a shift toward healthier dietary choices during the pandemic.

Compared to before the pandemic, the intake of B-complex vitamins and multivitamins with minerals decreased, whereas vitamin C, vitamin D, zinc, Omega 3 fatty acids, and probiotics saw increased usage. Specifically, vitamin D intake rose to 67.4 % and vitamin C intake to 54.7 %, doubling vitamin C intake compared to pre-pandemic levels. Details on the changes in the distribution of food supplements before and during COVID-19 are shown in Figure 2.

Comparative Analysis of MEDAS Scores and Mediterranean Diet Adherence by Sex

A comparative analysis of Mediterranean diet adherence by sex revealed several significant differences (Table 3). Women had higher MEDAS scores (mean 6.7) compared to men (mean 6.1), with a statistically significant difference ($p = 0.009$). Women showed higher adherence to various MD components, including higher vegetable consumption and lower red meat, sweet beverages, and butter consumption ($p < 0.05$).

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Table 1. **Sociodemographic characteristics of the participants**

Таблица 1. **Социально-демографические характеристики участников исследования**

	Total sample / Вся выборка	**Women / Женщины**	**Men / Мужчины**
	n (%)	*n* (%)	*n* (%)
	400 (100)	290 (72.5)	110 (27.5)
Age, years / Возраст, лет [1]	29.0 ± 9.3	28.5 ± 9.5	30.5 ± 8.7
Body Mass Index, kg/m² / Индекс массы тела, кг/м² [1]	23.9 ± 4.2	23.2 ± 4.2	25.7 ± 3.7
Nutritional status / Статус питания[2]	$p < 0.0001$ [3]		
Underweight / Недостаточный вес	19 (4.8)	18 (6.2)	1 (0.9)
Normal weight / Оптимальный вес	240 (60.0)	192 (66.2)	48 (43.6)
Overweight / Избыточный вес	112 (28.0)	61 (21.0)	51 (46.4)
Obese (Class I) / Ожирение I ст.	23 (5.8)	14 (4.8)	9 (8.2)
Obese (Class II) / Ожирение II ст.	5 (1.3)	5 (1.7)	0 (0)
Obese (Class III) / Ожирение III ст.	1 (0.3)	0 (0)	1 (0.9)
Location / Регион проживания[2]	$p = 0.02$ [3]		
Marmara Region / Мраморноморский регион	231 (57.8)	175 (60.3)	56 (50.9)
Central Anatolia Region / Центральная Анатолия	78 (19.5)	50 (17.2)	28 (25.5)
Black Sea Region / Черноморский регион	25 (6.3)	20 (6.9)	5 (4.5)
Mediterranean Region / Средиземноморский регион	21 (5.3)	15 (5.2)	6 (5.5)
Aegean Region / Эгейский регион	19 (4.8)	17 (5.9)	2 (1.8)
Eastern Anatolia Region / Восточная Анатолия	14 (3.5)	4 (1.4)	10 (9.1)
Southeastern Anatolia Region / Юго-Восточная Анатолия	12 (3.0)	9 (3.1)	3 (2.7)
Age category, years / Возрастная группа, лет[2]	$p < 0.0001$ [3]		
18–24	124 (31.0)	100 (34.5)	24 (21.8)
25–34	191 (47.8)	141 (48.6)	50 (45.5)
35–44	49 (12.3)	19 (6.6)	30 (27.3)
45–54	25 (6.3)	21 (7.2)	4 (3.6)
55–65	11 (2.8)	9 (3.1)	2 (1.8)
Level of education / Уровень образования[2]	$p = 0.115$ [3]		
Elementary education / Начальное	5 (1.3)	4 (1.4)	1 (0.9)
High school education / Среднее	33 (8.3)	30 (10.3)	3 (2.7)
Associate or Bachelor's Degree / Среднее специальное или степень бакалавра	237 (59.3)	167 (57.6)	70 (63.6)
Master's Degree / Степень магистра	107 (26.8)	78 (26.9)	29 (26.4)
Doctoral Degree (PhD) / Докторская степень	18 (4.5)	11 (3.8)	7 (6.4)
Occupational status / Статус занятости[2]	$p = 0.001$ [3]		
Unemployed / Безработный	52 (13.0)	47 (16.2)	5 (4.5)
Retired / Пенсионер	11 (2.8)	8 (2.8)	3 (2.7)
Student / Студент	111 (27.8)	84 (29.0)	27 (24.5)
Employed (On-site) / Работающий (вне дома)	165 (41.3)	104 (35.9)	61 (55.5)
Employed (Remote/Telecommuting) / Работающий удаленно/дистанционно	40 (10.0)	28 (9.7)	12 (10.9)
Temporarily unemployed/suspended / Временно безработный/работа приостановлена	21 (5.3)	19 (6.6)	2 (1.8)

Notes: [1] Data are expressed as means with standard deviation in separate columns; [2] data are expressed as the number (*n*) and proportion (%) of the respondents; [3] *p*-value: null hypothesis of same distribution between both sexes (chi-squared and Fisher exact test) with the null hypothesis rejected at $p < 0.05$.

Примечания: [1] Данные представлены в виде средних значений со стандартным отклонением в отдельных столбцах; [2] данные представлены в виде числа (*n*) и доли (%) респондентов; [3] *p*-значение: нулевая гипотеза об одинаковом распределении между обоими полами (хи-квадрат и точный тест Фишера), при этом нулевая гипотеза отвергается при $p < 0,05$.

In contrast, men were more likely to consume fish and seafood (12.7 % vs. 3.8 % for women) ($p = 0.002$) and wine (2.7 % vs. 0.0 % for women) ($p = 0.020$). The proportion of participants with high adherence to the Mediterranean diet was low in both sexes, with 6.6 % of women and 4.5 % of men classified as having high adherence. Overall, adherence to the Mediterranean diet was higher among women than men (Table 3).

Discussion

The observed differences in nutritional status, particularly in BMI and weight categories between men and women, align with existing literature. In our study, women exhibited a significantly lower mean BMI compared to men and were more frequently classified within the normal weight range. These findings support previous research indicating that men tend to have

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Table 2. **Comparison of lifestyle habits before and during the COVID-19 pandemic**
Таблица 2. **Сравнение привычного образа жизни до и во время пандемии COVID-19**

Lifestyle habits / Привычки образа жизни	Before / до COVID-19	During / во время COVID-19
Smoking habits / Курение		
Non-smoker / Некурящие	285 (71.3)	294 (73.5)
Light smoker (less than 5 per day) / Мало курящие (< 5 сигарет в день)	29 (7.3)	41 (10.3)
Moderate smoker (5–10 per day) / Умеренно курящие (5–10 сигарет в день)	42 (10.5)	26 (6.5)
Heavy smoker (more than 10 per day) / Много курящие (> 10 сигарет в день)	44 (11)	39 (9.8)
Sleep duration / Продолжительность сна		
Inadequate sleep (less than 7 hours) / Недостаточная (< 7 часов)	132 (33.0)	104 (26.0)
Optimal sleep (between 7–9 hours) / Оптимальная (7–9 часов)	246 (61.5)	240 (60.0)
Excessive sleep (more than 9 hours) / Избыточная (> 9 часов)	22 (5.5)	56 (14)
Physical activity / Физическая активность		
Sedentary lifestyle (no sports) / Сидячий образ жизни (без занятий спортом)	177 (44.3)	222 (55.5)
Low activity level (1–2 times a week) / Низкая (занятия спортом 1–2 раза в неделю)	148 (37.0)	116 (29.0)
Moderate activity level (3–4 times a week) / Средняя (3–4 раза в неделю)	60 (15.0)	31 (7.8)
High activity level (more than 5 times a week) / Высокая (> 5 раз в неделю)	15 (3.8)	31 (7.8)
Changes in eating behavior / Изменение пищевого поведения		
Eating behavior remains unchanged / Без изменений		168 (42.0)
Eating behavior has improved / Пищевое поведение улучшилось		148 (37.0)
Eating behavior has worsened / Пищевое поведение ухудшилось		84 (21.0)
Changes in appetite / Изменение аппетита		
No change in appetite / Без изменений		142 (35.5)
Increased appetite observed / Повышение		215 (53.8)
Decreased appetite observed / Снижение		43 (10.8)
Changes in weight / Изменение массы тела		
No change in weight / Без изменений		132 (33.0)
Weight loss observed / Потеря веса		75 (18.8)
Weight gain observed / Набор веса		162 (40.5)
Significant weight gain observed / Значительный набор веса		31 (7.8)
Supplement use / Использование пищевых добавок		
No / Нет	299 (74.8)	233 (58.3)
Yes / Да	101 (25.3)	167 (41.8)

higher BMI values and are more often categorized as overweight or obese than women [18]. Although global data from 2016 also reported a higher prevalence of obesity among women, the proportion of individuals classified as overweight was nearly equal between the sexes [19]. It is important to note, however, that these patterns vary by region. For example, in some Asian countries, including Korea, Japan, and China, obesity is more prevalent among men, contrary to the global averages [19].

The higher unemployment rate among women, which was significant in this study, may contribute to differences in lifestyle and dietary behaviors. Economic and social factors can influence dietary choices, as unemployment has been linked to poorer diet quality. A recent study in Türkiye documented that a high BMI is associated with marriage, aging, and physical inactivity. Interestingly, employment status has different impacts on the BMI of men and women. The study also identified a BMI gap between men and women due to differences in certain sociodemographic and behavioral factors, and this gap widens at the upper and lower quantiles of the BMI distribution [20]. In contrast, a national-level survey in Saudi Arabia found that women had a higher BMI than men [21].

The changes in smoking, sleep, physical activity, and eating habits during the COVID-19 pandemic echo global trends. The reduction in smoking observed in this sample is consistent with findings from other studies reporting decreases in smoking during the pandemic due to heightened health awareness [22–24]. The COVID-19 lockdown was associated with increased quit attempts [25]. Conversely, the increase in sedentary lifestyles associated with working from home and weight gain during the pandemic is concerning, as these shifts are linked to long-term health risks, including metabolic syndrome and cardiovascular disease [26, 27].

A study that evaluated 72 patients at an outpatient neuroendocrine disease clinic showed a significant increase in metabolic syndrome, obesity, and dyslipidemia prevalence at the end of the first lockdown imposed in Italy compared to pre-lockdown levels [28]. The increase in self-reported worsened eating behaviors, combined with a significant proportion of participants reporting weight gain (48.3 %), suggests that stress and disruption of routines played a role

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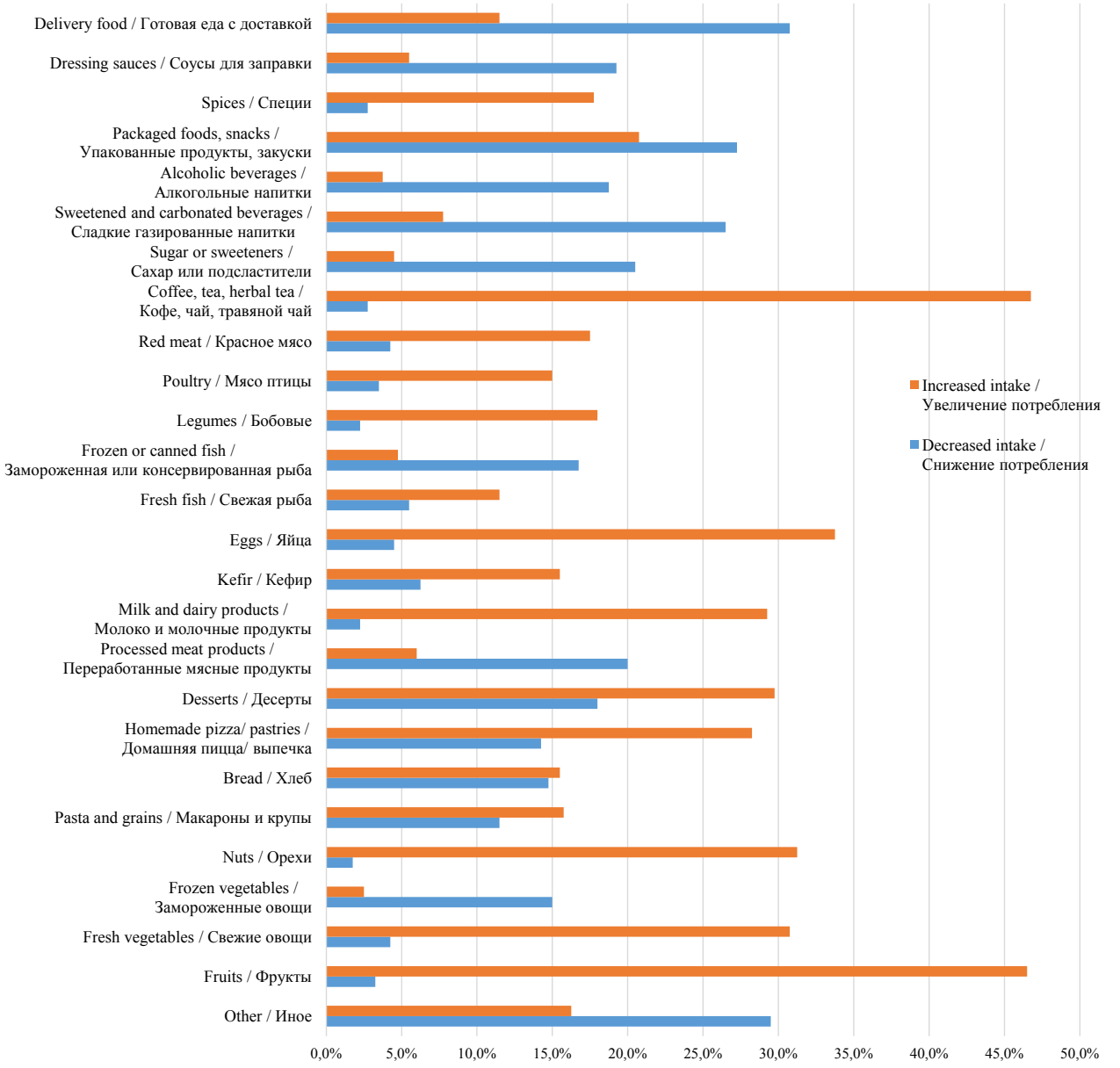

Fig. 1. Fluctuations in food consumption patterns during the COVID-19 pandemic

Рис. 1. Изменения в моделях потребления продуктов питания во время пандемии COVID-19

Note: "Other" refers to the participants who reported increased or decreased intake of foods not included in the listed categories or who did not provide a specific answer for individual food groups.

Примечание: «Иное» относится к участникам, которые сообщили об увеличении или уменьшении потребления продуктов, не включенных в перечисленные категории, или которые не дали конкретного ответа по отдельным группам продуктов.

in these negative lifestyle changes. These findings align with other research showing that the COVID-19 pandemic led to both improvements and declines in dietary habits, depending on various individual and contextual factors, representing a massive impact on human health through social distancing and isolation at home, with associated social and economic consequences [17, 29].

Despite the overall negative impact on certain lifestyle factors, the respondents noted positive changes in their dietary habits, particularly an increased intake of fresh fruits, vegetables, nuts, and dairy products. This shift could be linked to a heightened awareness of the importance of immune-boosting nutrients during the pandemic, prompting healthier food choices. Foods like oranges, kiwi, beetroot, eggplant, broccoli, papaya, and mushrooms were particularly recognized as immune boosters during COVID-19, primarily due to their rich content of essential minerals such as zinc and magnesium, as well as vitamins C, D, and E [30]. Moreover, we found a notable rise in the consumption of spices and herbal teas during the pandemic. This aligns with findings from studies conducted in Saudi Arabia and India, where participants reported an increased intake of immune-boosting foods such as ginger, garlic, and turmeric [31, 32]. Additionally, it was found that a significant 93.6 % of 531 surveyed individuals believed that spices could help cure coronavirus or other viral infections and boost immunity [33].

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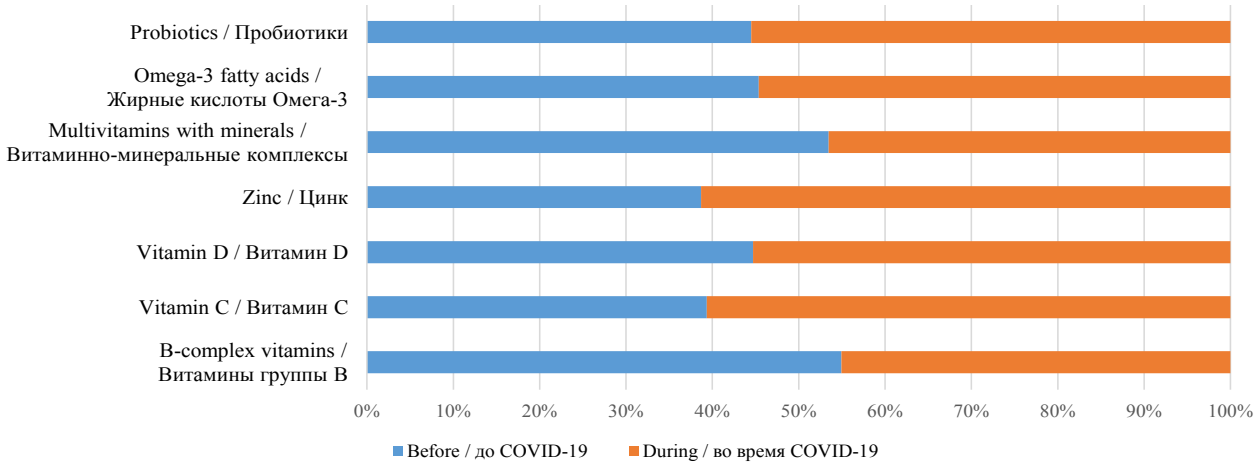

Fig. 2. Changes in supplement consumption before and during the COVID-19 pandemic
Рис. 2. Изменения в потреблении пищевых добавок до и во время пандемии COVID-19

Table 3. **Comparative analysis of MEDAS scores and Mediterranean diet adherence by sex**
Таблица 3. **Сравнительный анализ баллов по шкале MEDAS и приверженности средиземноморской диете по полу**

	Total sample / Вся выборка (*n* = 400)	Women / Женщины (*n* = 290)	Men / Мужчины (*n* = 110)	*p*
Olive oil, main dressing / Оливковое масло, основная заправка	250 (62.5)	182 (62.8)	68 (61.8)	0.862[a]
Olive oil, ≥ 4 ts/day / Оливковое масло, ≥ 4 ст. л./д.	168 (42.0)	128 (44.1)	40 (36.4)	0.160[a]
Vegetables, ≥ 2 s/day / Овощи, ≥ 2 порц./д.	**178 (44.5)**	**151 (52.1)**	**27 (24.5)**	**0.000[a]****
Fruits, ≥ 3 s/day / Фрукты, ≥ 3 порц./д.	85 (21.3)	60 (20.7)	25 (22.7)	0.758[b]
Red meat, < 1 s/day / Красное мясо, < 1 порц./д.	**257 (64.3)**	**205 (70.7)**	**52 (47.3)**	**0.000[a]****
Butter, < 1 s/day / Сливочное масло, < 1 порц./д.	**305 (76.3)**	**229 (79.0)**	**76 (69.1)**	**0.038[a]***
Sugar-sweetened carbonated beverages, < 1 s/day / Сладкие газированные напитки, < 1 порц./д.	**301 (75.3)**	**229 (79.0)**	**72 (65.5)**	**0.005[a]****
Wine, 7 s/week / Вино, 7 порц./нед.	**3 (0.8)**	**0 (0.0)**	**3 (2.7)**	**0.020[c]***
Legumes, ≥ 3 s/week / Бобовые, ≥ 3 порц./нед.	137 (34.3)	92 (31.7)	45 (40.9)	0.084[a]
Fish and seafood, ≥ 3 s/week / Рыба и морепродукты, ≥ 3 порц./нед.	**25 (6.3)**	**11 (3.8)**	**14 (12.7)**	**0.002[b]****
Commercial (not homemade) pastry, < 3 s/week / Промышленная выпечка, < 3 порц./нед.	288 (72.0)	206 (71.0)	82 (74.5)	0.485[a]
Nuts, ≥ 3 s/week / Орехи, ≥ 3 порц./нед.	165 (41.3)	115 (39.7)	50 (45.5)	0.293[a]
White meat over red / Предпочтение белого мяса красному	208 (52.0)	154 (53.1)	54 (49.1)	0.473[a]
Sofritto / Софрито	242 (60.5)	179 (61.7)	63 (57.3)	0.416[a]
MEDAS score / Баллов MEDAS	**Mean [IQR] / Среднее [МКР]**			
	6.5 [5–8]	**6.7 [5–8]**	**6.1 [4–8]**	**0.009[d]****
Adherence to the MD / Приверженность средиземноморской диете				
Low / Низкая	121 (30.3)	78 (26.9)	43 (39.1)	0.056[a]
Moderate / Средняя	255 (63.7)	193 (66.6)	62 (56.4)	
High / Высокая	24 (6.0)	19 (6.6)	5 (4.5)	

Notes: Positive answers to the MEDAS questionnaire. Compliance rates of at least 50% were indicated in bold. Data were expressed as frequency and percentage in parentheses (*n* (%)) for categorical variables.
Vegetables daily serving: 1 medium portion = 200 g. Fruit daily serving: 1 serving = 100–150 g. Red meat/hamburgers/other meat daily serving: 1 medium portion = 100–150 g. Butter, margarine, or cream daily serving: 1 medium portion = 12 g. Sugar-sweetened carbonated beverages daily serving: 1 medium portion = 200 ml. Wine daily serving: 1 medium portion = 125 ml. Legumes weekly serving: 1 portion = 150 g. Fish daily serving: 1 medium portion = 100–150 g. Seafood daily serving: 1 medium portion = 200 g. Nuts weekly serving: 1 portion of nuts = 30 g.
MEDAS: Mediterranean diet adherence screener; MD: Mediterranean diet; s: serving; ts: tablespoon
The Shapiro–Wilk test was performed to evaluate variable distribution.
[a] Chi-square test, [b] continuity correction, [c] Fisher's exact test for categorical variables, and [d] Mann-Whitney U test for continuous variables for sex difference. Interquartile Range (IQR), Mean [IQR] for continuous variables. *$p < 0.05$; **$p < 0.01$.

Примечания: Положительные ответы на вопросы MEDAS. Жирным шрифтом выделены показатели соответствия не менее 50 %. Данные представлены в виде частоты и процента в скобках (*n* (%)) для категориальных переменных.
Дневная порция овощей: 1 средняя порция = 200 г. Дневная порция фруктов: 1 порция = 100–150 г. Красное мясо/гамбургеры/другое мясо, дневная порция: 1 средняя порция = 100–150 г. Сливочное масло, маргарин или сливки, дневная порция: 1 средняя порция = 12 г. Сладкие газированные напитки, дневная порция: 1 средняя порция = 200 мл. Вино, дневная порция: 1 средняя порция = 125 мл. Бобовые, недельная порция: 1 порция = 150 г. Рыба, дневная порция: 1 средняя порция = 100–150 г. Морепродукты, дневная порция: 1 средняя порция = 200 г. Орехи, недельная порция: 1 порция орехов = 30 г.
MEDAS: скрининг соблюдения средиземноморской диеты; MD: средиземноморская диета.
Для оценки распределения переменных использовался тест Шапиро–Уилка.
[a] критерий хи-квадрат, [b] коррекция непрерывности, [c] точный тест Фишера для категориальных переменных и [d]U-критерий Манна–Уитни для непрерывных переменных на предмет различий между полами. Межквартильный размах (МКР), среднее (МКР) для непрерывных переменных; *$p < 0,05$; **$p < 0,01$.

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The decreased consumption of processed and takeout foods suggests a possible shift from convenience-based eating to more home-cooked and health-conscious meals. Another study has similarly observed an increase in the intake of healthier food options during the pandemic, highlighting the potential long-term benefits of these dietary shifts [34].

The substantial increase in supplement use, particularly vitamins D and C, reflects growing concern over maintaining immune function during the pandemic. Research has highlighted the role of vitamin D in reducing the severity of COVID-19 symptoms, which likely contributed to its increased consumption [35]. Similarly, the sharp rise in vitamin C usage may reflect public interest in boosting immune defense despite limited evidence supporting its efficacy in COVID-19 prevention [36]. The increased use of zinc and omega-3 fatty acids further indicates a trend toward proactive health management during the pandemic, driven by both media and scientific communication regarding immune health [37].

The higher adherence to the Mediterranean diet among women, as indicated by higher MEDAS scores, aligns with findings from other studies, which report that women are generally more health-conscious and more likely to follow dietary guidelines than men [38, 39]. Women consumed more vegetables and less red meat, sweetened beverages, and butter, consistent with global dietary patterns that associate these food choices with healthier diets [40]. Furthermore, a study found that women had significantly higher adherence to the Mediterranean diet than men [41]. In contrast, a recent meta-analysis demonstrated no statistically significant difference in adherence or retention by gender [42]. However, the overall low adherence to the Mediterranean diet among both sexes is concerning, given its strong association with reduced risks of chronic diseases and improved long-term health outcomes. Therefore, public health strategies should focus on increasing awareness and access to Mediterranean diet components, particularly among men.

While this study provides important insights, it has several limitations. The reliance on self-reported data may introduce bias, and the cross-sectional nature of the study limits the ability to infer causality. Additionally, the sample may not be fully representative of all demographic groups.

Conclusions

This study offers important insights into the alterations in lifestyle and dietary habits induced by the COVID-19 pandemic. The findings indicate notable shifts in various behavioral aspects among the participants. Specifically, there was a reduction in the prevalence of heavy smoking, increased sedentary behavior, and alterations in sleep patterns. Dietary behaviors also evolved, with a marked rise in supplement use, increased appetite, and significant weight gain reported by many participants. Furthermore, adherence to the Mediterranean diet demonstrated variability, with some components of the diet being less adhered to during the pandemic.

The increased sedentary behaviors observed during the pandemic highlight a critical need to promote regular physical activity. Public health campaigns should focus on the benefits of maintaining an active lifestyle and provide resources for people to participate in home exercise routines during future pandemics and quarantines. Additionally, the changes in dietary habits call for developing updated nutritional guidelines that address contemporary eating patterns. Emphasizing balanced nutrition and adherence to dietary guidelines, such as the Mediterranean diet, may mitigate the adverse health effects associated with the pandemic.

The observed increase in the propensity to adopt a healthy diet and use dietary supplements, particularly vitamins and minerals, suggests that individuals may have sought to improve their health during that period by following healthy dietary advice and using dietary supplements. In addition, the types of supplements used were found to have changed in line with recommendations made by health professionals during the pandemic. The public also tended to follow the advice given by health authorities. This suggests that it is extremely important for healthcare providers to offer guidance on the appropriate use of dietary supplements and to ensure that individuals are informed about the benefits and limitations of different dietary supplements.

Overall, the findings highlight the need for targeted public health interventions to address the negative impacts of the pandemic on lifestyle and dietary habits. Strategies should emphasize the promotion of physical activity, the adoption of healthy eating practices, and the judicious use of dietary supplements. Incorporating these recommendations into public health initiatives may support the maintenance of healthy behaviors and enhance resilience during future public health crises.

Future research should focus on exploring the long-term effects of the pandemic on lifestyle and dietary behaviors and evaluating potential interventions to address these changes. Longitudinal studies would provide valuable insights into the persistence of these behaviors over time and their implications for long-term health outcomes.

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Compliance with ethical standards: The authors declare that the protocols of the Declaration of Helsinki were followed for all experiments involving human subjects and that all procedures were carried out with the informed consent of the participants. Participants completed the questionnaire directly through the Google platform, where their personal information, including names, was anonymized to ensure and protect confidentiality. Due to the anonymous nature of the web survey, no sensitive personal data could be traced back to any individual. Upon completion, each questionnaire was transmitted to the Google platform, and the final database was subsequently downloaded as a Microsoft Excel file.
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Информация о вкладе авторов: концепция и дизайн исследования, сбор данных: *Чакмак Кавсара С.*; анализ и интерпретация результатов, обзор литературы: *Кавсара Х.К.*; подготовка рукописи: *Чакмак Кавсара С.*, *Кавсара Х.К.* Оба автора рассмотрели результаты и одобрили окончательный вариант рукописи.
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