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RESEARCH / ARAŞTIRMA

Changes in Nutrition, Sleep, and Well-being During and After COVID-19 Lockdown: A Longitudinal Study

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ABSTRACT

Objective: This study aimed to evaluate changes in dietary intake, anthropometric measures, physical activity, sleep quality, and psychological well-being during the COVID-19 lockdown and post-lockdown periods among adult women in Turkey.
Material and Methods: A total of 129 women aged 19–60 participated in this longitudinal study conducted the first lockdown period in May and July 2020. Data were collected through three-day dietary records, one-day physical activity logs, anthropometric measurements, the Pittsburgh Sleep Quality Index, the Turkish Emotional Eating Scale, and the PERMA Well-Being Scale. Dietary data were analyzed using the BEBIS software.
Results: There were no significant differences in total energy, carbohydrate, protein, or fat intake during and after the isolation period. However, intake of omega-3 fatty acids, polyunsaturated fats, fiber, and vitamin C was significantly higher during lockdown. PERMA scores were lower, and negative emotions and loneliness scores were higher during lockdown ($p<0.001$). Sleep quality remained poor in both periods. Regression analyses showed that increases in protein and omega-3 intake were associated with improvements in sleep and well-being, while higher saturated fat and energy intake were linked to negative outcomes.
Conclusion: This study demonstrates that psychological status and sleep quality during crisis periods can be influenced by nutrition, and highlights the positive effects of omega-3 fatty acids on sleep quality and overall well-being. Therefore, increasing omega-3 fatty acid intake may be considered a beneficial strategy for improving sleep and emotional health, particularly in stressful or socially restrictive situations such as isolation.
Keywords: COVID-19, emotional eating, nutrition, sleep quality, well-being.

COVID-19 Karantinası Sürecinde ve Sonrasında Beslenme, Uyku ve İyi Oluşta Meydana Gelen Değişiklikler: Longitudinal Çalışma

ÖZET

Amaç: Bu çalışmanın amacı, COVID-19 izolasyon ve açılma dönemlerinde Türkiye'deki yetişkin kadınların besin alımı, antropometrik ölçümleri, fiziksel aktivite düzeyi, uyku kalitesi ve psikolojik iyi oluşlarındaki değişimleri değerlendirmektir.
Gereç ve Yöntem: Mayıs ve Temmuz 2020 tarihlerinde yürütülen bu uzunlamasına çalışmaya 19–60 yaş aralığında 129 kadın katılmıştır. Veriler; üç günlük besin tüketim kaydı, bir günlük fiziksel aktivite kaydı, antropometrik ölçümler, Pittsburgh Uyku Kalitesi İndeksi, Türkçe Duygusal Yeme Ölçeği ve PERMA İyi Oluş Ölçeği kullanılarak toplanmıştır. Beslenme verileri BEBIS programı ile analiz edilmiştir.
Bulgular: İzolasyon döneminde ve sonrasında katılımcıların toplam enerji, karbonhidrat, protein ve yağ alımında anlamlı bir fark bulunmamıştır. Ancak omega-3 yağ asitleri, çoklu doymamış yağ asitleri, posa ve C vitamini alımı izolasyon döneminde anlamlı şekilde daha yüksektir. PERMA puanları izolasyon döneminde daha düşük; olumsuz duygu ve yalnızlık puanları ise daha yüksek bulunmuştur ($p<0,001$). Uyku kalitesi her iki dönemde de düşük düzeyde kalmıştır. Regresyon analizleri, protein ve omega-3 alımındaki artışın uyku ve iyi oluş üzerinde olumlu etkili olduğunu; doymuş yağ ve enerji alımındaki artışın ise olumsuz etkilerle ilişkili olduğunu göstermiştir.
Sonuç: Bu çalışma, kriz dönemlerinde psikolojik durumun ve uyku kalitesinin beslenmeden etkilendiğini; özellikle omega-3 yağ asitlerinin uyku kalitesi ve genel iyi oluş üzerindeki olumlu etkilerini ortaya koymaktadır. Bu nedenle, izolasyon gibi stresli veya sosyal olarak kısıtlayıcı durumlarda omega-3 yağ asidi alımının artırılması, uyku ve duygusal sağlık açısından yararlı bir strateji olarak değerlendirilebilir
Anahtar Kelimeler: COVID-19, duygusal yeme, beslenme, uyku kalitesi, iyi oluş.

1. Introduction

The COVID-19 outbreak has been considered one of the most significant global challenges since World War II (1). In addition to high rates of mortality and morbidity, the pandemic has dramatically altered individuals' lifestyles and profoundly affected national and global healthcare systems and economies (2,3). Due to the person-to-person transmission of COVID-19 through close contact, social lockdown is regarded as one of the most effective preventive measures. Since the World Health Organization (WHO) declared COVID-19 a global pandemic, many countries have enforced social lockdowns (4,5). However, because humans are inherently social beings, lockdown may lead to stress, psychological problems, and mood disturbances. It can also result in changes in sleep patterns, mealtimes, and eating habits, while promoting a sedentary lifestyle (2,6). A study

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reported that Americans working from home spent 1.7 times more time preparing meals and 2.6 times more time eating and drinking (7). Another study showed that the amount of time spent in sedentary activities increased from 5 to 8 hours per day, and there was a general decline in physical activity levels (8,9). The pandemic period is inherently stressful, and stress is directly related to eating habits. Individuals may eat more frequently and in larger quantities as a coping mechanism for heightened fear and anxiety or due to the disruption of daily routines. During this time, a tendency toward overeating may increase, particularly with a preference for foods rich in simple carbohydrates, saturated fats, and sodium, especially during late hours (3,6,8,10).

Adequate and balanced nutrition plays a vital role in both protection from and recovery from during infectious diseases such as COVID-19 (11). The WHO emphasizes the importance of dietary diversity for a healthy life and recommends obtaining all necessary nutrients, especially from fresh and unprocessed foods. Similarly, the Food and Agriculture Organization (FAO) has also made similar recommendations, highlighting not only healthy eating but also the importance of avoiding tobacco and alcohol, engaging in regular physical activity, managing stress, and obtaining adequate sleep for overall health (12). To strengthen their immune systems and protect themselves against infection, many people have turned to healthier eating habits and/or the use of dietary supplements (13). However, research has shown that the impact of social lockdown during the COVID-19 pandemic on eating habits has varied. Some studies report increased intake of water, vegetables, fruits, legumes, and protein, along with improved adherence to the Mediterranean Diet (14-16). Conversely, other studies indicate an increase in the consumption of high-energy and sugary foods, which is associated with unhealthy eating behaviors (15-17). Nevertheless, some studies have reported no significant differences in nutrient intake during this period (17,18).

It is anticipated that lockdown may hinder the production, affordability, and accessibility of safe foods, thus altering individuals' dietary habits (8,19). In particular, limited access to fresh fruits and vegetables may drive individuals toward highly processed foods that are high in sodium, fat, and sugar (6). Although numerous studies have examined dietary patterns, food group consumption, and changes in eating behaviors during the COVID-19 lockdown period, research focusing on changes in energy and nutrient intake remains limited. Therefore, the aim of this study was to evaluate changes in anthropometric measures, physical activity, sleep quality, and psychological well-being, energy intake, and macro- and micronutrient consumption during and after the COVID-19 lockdown period.

2. Materials and Methods

2.1. Research Type and Sample of the Research

This study was conducted between May and July 2020 with 129 adult women aged 19–60 residing in various provinces of Turkey. Initially, 147 participants were recruited; however, the study was completed with 129 participants due to the exclusion of 4 individuals with health issues, 8 individuals whose dietary records could not be obtained, 2 individuals who became pregnant, and 4 individuals who chose not to continue. A post hoc power analysis was conducted using G*Power version 3.0.10 (20). For a paired samples t-test with an alpha of 0.05, a sample size of 129, and an assumed medium effect size (dz = 0.5), the statistical power was calculated to be 0.99. This finding indicates that the study had sufficient power to detect medium-sized effects. Data were collected through verbal communication via phone interviews, WhatsApp images, or email via a snowball sampling method.

2.2. Data Collection

The data collection form included socio-demographic characteristics, three-day dietary intake and one-day physical activity records, anthropometric measurements (height, body weight, waist circumference), the Pittsburgh Sleep Quality Index to assess sleep quality and disturbances, the PERMA Well-Being Scale to evaluate psychological well-being, and the Turkish version of the Emotional Eating Scale to assess emotional eating behaviors. May 2020 was designated as the "lockdown period," and July 2020 was designated the "postlockdown period." Sociodemographic data were collected once, while other variables were assessed during both time periods. Individuals diagnosed with COVID-19; those following a dietary program; pregnant or lactating women; and individuals with neurological or psychiatric disorders were excluded from the study

2.3. Implementation of the Research

2.3.1. Dietary intake records

To assess the nutritional status of the participating women, three-day dietary intake records were collected (covering two weekdays and one weekend day). The participants' dietary intake was assessed using a combination of daily telephone interviews and the evaluation of meal photographs submitted by the participants. The data were analyzed basis of the average of the three days. Standard recipes and food and nutrition photograph catalogs were used to estimate the amounts of ingredients in consumed meals (21,22). Following the quantification of intake, daily energy, macro- and micronutrient intake were calculated via the Nutrition Information System software (BEBIS) and categorized into food groups (22).

2.3.2. Physical activity record

To assess physical activity levels, participants provided one-day physical activity records. The types and durations of grouped physical activities (e.g., sitting, desk work, standing, slow/fast walking, resting, sleeping) were recorded. The Physical Activity Level (PAL) was calculated by multiplying the duration (minutes) of each activity by its standard Physical Activity Ratio (PAR), summing the results, and dividing by the total daily time (1440 minutes) (23).

2.3.3. Anthropometric measurements

Anthropometric measurements were not taken by the researchers directly. Instead, the measurement techniques to be used were explained to the participants through visual guides, and data were collected on the basis of self-reports. Participants were instructed to measure their body weight using a home scale, while they were wearing light clothing and standing barefoot. For height measurement, they were asked to stand with their feet together, knees straight, heels, buttocks, and shoulder blades touching a vertical surface, and their head in the Frankfurt plane, using a measuring tape. Waist circumference was measured by marking a point one finger above the navel and wrapping the tape measure horizontally around the waist, parallel to the floor (24). BMI was calculated by dividing weight by height in meters squared.

2.3.4. Pittsburgh Sleep Quality Index (PSQI)

This scale was found to be high, with a Cronbach's alpha of 0.830 in the original study by Buysse et al. (25), and 0.800 in the Turkish validity and reliability study conducted by Agargün et al. (26). The PSQI is a self-reported assessment tool that provides detailed information on sleep quality and disturbances over the

Table 1. Comparison of participants' work status, dietary habits, emotional eating status, anthropometric measurements and lifestyle variables between lockdown and post-lockdown periods

	Lockdown Period	Post-Lockdown Period	p
Work Status (n (%))	57 (44.2)	64 (49.6)	0.118 [a]
	Mean ± SD	**Mean ± SD**	
Number of working days per week	4.67±1.20	5.09±0.75	**0.005[b]**
Daily working hours (h)	7.34±4.66	7.97±3.63	0.514[b]
Dietary Habits			
Main meals per day	2.37±0.52	2.46±0.54	**0.027[b]**
Snacks per day	1.70±0.79	1.69±0.88	0.879[b]
Emotional Eating Scale Score	64.57±20.10	64.43±19.01	0.803[b]
Anthropometric Measurements			
Body weight (kg)	65.23±11.47	65.60±11.49	**0.018[b]**
Waist circumference (cm)	80.64±13.21	80.63±13.15	0.918[b]
BMI (kg/m²)	24.67±4.37	24.82±4.38	**0.016[b]**
PAL	1.35±0.01	1.40±0.14	**<0.001[b]**
PSQI Score	9.97±2.25	10.16±2.27	0.195[b]
PERMA Well-Being Scale Score	6.25±0.90	7.21±0.92	**<0.001[b]**
Negative Emotion Subscale	-0.935±1.31	-1.16±-0.71	**<0.001[b]**
Loneliness Subscale	-0.67±2.14	-1.05±-0.30	**<0.001[b]**

[a]McNemar test, [b]Paired samples t-test, BMI: Body Mass Index, PAL: Physical Activity Level, PSQI: Pittsburgh Sleep Quality Index

past month. The 18-item questionnaire has 7 components: habitual sleep efficiency, subjective sleep quality, sleep duration, sleep latency, daytime dysfunction, use of sleeping medication, and sleep disturbances. Each item is scored from 0 to 3. The sum of the 7 component scores yields a total PSQI score ranging from 0 to 21. A total score <5 indicates "good" sleep quality, whereas a score ≥5 indicates "poor" sleep quality (26).

2.3.5. PERMA Well-Being Scale

The internal consistency of the PERMA Well-Being Scale was reported to be high, with a Cronbach's alpha of 0.88 in the original study by Butler and Kern (27), and 0.90 in the Turkish adaptation study conducted by Demirci et al. (28).The PERMA Scale measures five components of well-being through 15 primary and 8 filler items (total of 23). The subdimensions include Positive Emotion (P), Engagement (E), Relationships (R), Meaning (M), and Accomplishment (A). The filler items assess Health (H), Negative Emotion (N), and Loneliness (L). Among the filler items, items 7, 12, 14, and 20 are reverse-coded. The 15-item scale includes 3 items for each subdimension. Subscale scores are calculated by taking the average of the three items in each respective subdimension (28).

2.3.6. Turkish Emotional Eating Scale (TEES)

Designed by Bilgen SŞ and validated in her study, the Turkish Emotional Eating Scale demonstrated Cronbach's alpha coefficients of 0.960 in the first stage, 0.962 in the second stage, and 0.959 in the third stage. This 30-item Likert-type scale assesses eating motivations influenced by positive or negative emotions. The TEES uses a five-point Likert-type response format: (5) Almost always, (4) Often, (3) Sometimes, (2) Rarely, and (1) Never. Based on the scale evaluation, individuals with higher emotional eating scores were identified as having a tendency toward emotional eating. The scale consists of four factors; Factor 1: Eating in Response to Tension (11 items), Factor 2: Eating to Cope with Negative Emotions (10 items), Factor 3: Ability to Control Oneself (6 items), Factor 4: Control in the Presence of External Stimuli (3 items). A higher score indicates a greater tendency toward emotional eating (29).

2.3.7. Analysis of research data

The data were analyzed via IBM SPSS Statistics version 25.0. Descriptive statistics are presented as frequencies (n) and percentages (%), and the McNemar test was used. For comparisons between the lockdown and post-lockdown periods, the paired samples t-test was applied for normally distributed data, and the Wilcoxon signed-rank test was used for non-normally distributed data. Normality was assessed via the Shapiro-Wilk test, histograms, normality plots, and skewness-kurtosis values. Linear regression was used to analyze the relationships between changes (delta Δ) in the PERMA Well-Being and PSQI scores and the changes in consumption of selected macronutrients. The results of the regression analyses were presented with β-coefficients (95% confidence intervals [CI]) and p-values. For all the statistical tests p<0.05 was considered significant.

2.4. Ethical Aspects of the Research

This study was approved by the Medical Research Ethics Committee of the Ege University Faculty of Medicine on 29.05.2020. No: 20-5.1T/17. Before the initiation of the study, the participants were provided with an electronic version of the informed consent form, which they signed and submitted prior to their inclusion in the research.

3. Results

The mean age of participants was 37.63 ± 11.28 years. Among the participants, 63.6% were married. In terms of educational status, 81.4% had at least a high school education.

During the lockdown period, 44.2% of the participants were working, whereas 49.6% were working during the post-lockdown period. The number of working days per week significantly increased during the post-lockdown period (p=0.005), whereas no significant change was observed in daily working hours. There was a statistically significant increase in the number of main meals per day in the post-lockdown period (2.37±0.52) compared with the lockdown period (2.46±0.54) (p=0.027) (Table 1). The mean height of the participants was 167.73±5.48 cm (not shown in the table). Body weight (p=0.018) and BMI (p=0.016) were significantly higher in the post-lockdown period. Similarly, the level of physical activity level was significantly higher during the post-lockdown period (p<0.001).

According to PSQI scores, there was no statistically significant difference (p>0.05) and all participants had poor sleep quality during both periods (not shown in the table). The mean PERMA Well-Being Scale score was 6.25±0.90 during lockdown and significantly increased in during the post-lockdown period (7.21±0.92) (p<0.001). The scores of the negative emotion subscale (-1.16±-0.71) and loneliness subscale (-1.05±-0.30) were also significantly higher during the lockdown period (-0.935±1.31 and -0.67±2.14 respectively) (p<0.001 for both) (Table 1).

There was no significant difference in energy intake between the lockdown and post-lockdown periods. Among macronutrients,

while the total fat intake did not significantly differ, the intake of polyunsaturated fatty acids and omega-3 fatty acids was significantly higher during the lockdown period (respectively 17.25 g [10.69], 14.90 g [11.25] p=0.036, 1.34 g [0.83], 1.24 g [0.61] p=0.004). Similarly, fiber (p=0.004) and vitamin C intake were also significantly higher during the lockdown period (19.02 g [8.10] and 16.70 g [9.33] p=0.004, 101.34 g [91.65] and 94.30 g [65.23] p=0.004, respectively) (Table 2).

Table 2. Distribution of energy, macro- and micronutrient intakes during lockdown and post-lockdown periods

	Lockdown Period	Post-Lockdown Period	
	Mean ± SD / Median [IQR]	**Mean ± SD / Median [IQR])**	**p**
Energy (kcal)	1689.41±561.67	1638.63±533.05	0.264[a]
Carbohydrates (%)	41.23±8.34	40.95±8.46	0.752[a]
Carbohydrates (g)	173.69±73.59	168.44±74.84	0.362[a]
Protein (g)	57.46±18.74	56.25±17.93	**0.444[a]**
Plant-based Protein (g)	25.93 [14.97]	23.80 [13.20]	0.054[b]
Animal-based Protein (g)	28.83 [15.54]	28.18 [16.94]	0.746[b]
Fat (%)	44.29±8.24	44.52±7.71	0.765[a]
Fat (g)	83.48±30.28	80.59±28.33	0.310[a]
SFA (g)	24.94 [13.00]	25.18 [12.00]	0.674[b]
MUFA (g)	29.48 [19.16]	29.59 [11.91]	0.364[b]
PUFA (g)	17.25 [10.69]	14.90 [11.25]	**0.036[b]**
Omega-3 (g)	1.34 [0.83]	1.24 [0.61]	**0.040[b]**
Fiber (g)	19.02 [8.10]	16.70 [9.33]	**0.004[b]**
Vitamin A (µg)	807.07 [600.97]	824.10 [485.64]	0.507[b]
Vitamin E (mg)	17.4 [10.87]	16.45 [12.62]	0.399[b]
Folate (µg)	136.58 [60.39]	132.99 [55.93]	0.244[b]
Vitamin B12 (µg)	2.83 [2.38]	2.82 [1.87]	0.197[b]
Vitamin C (mg)	101.34 [91.65]	94.30 [65.23]	**0.004[b]**
Calcium (mg)	537.96 [258.85]	547.84 [290.88]	0.697[b]
Iron (mg)	10.66 [3.95]	9.83 [4.26]	0.205[b]

[a]Paired samples t-test, [b]Wilcoxon signed-rank test, SFA: Saturated Fatty Acids, MUFA:Monounsaturated Fatty Acids, PUFA: Polyunsaturated Fatty Acids

According to linear regression analysis, changes in carbohydrate, protein, monounsaturated, polyunsaturated, and saturated fat intake were positively associated with changes in PERMA Well-Being scores. However, increased energy intake was associated with a decrease in PERMA Well-Being score. The model explains approximately 15.5% of the variance in well-being score changes (Table 3). Changes in BMI, protein, omega-3, and saturated fat intake explained 11.6% of the variance in PSQI score changes. Specifically, increases in BMI and saturated fat intake was associated with worsened sleep quality, whereas increases in protein and omega-3 intake were associated with improvements (Table 3).

Table 3. Linear regression analysis of differences (Δ) in PERMA Well-Being and PSQI scores and macronutrient intake changes.

Predictor (Δ)		**Beta (Unstandardized)**	**Std. Error**	**t**	**p**
Δ PERMA Well-Being Score	Constant	0.961	0.039	24.798	0.000
	Δ Energy (kcal)	-0.005	0.001	-3.854	**0.000**
	Δ Carbohydrate (g)	0.018	0.005	3.703	**0.000**
	Δ Protein (g)	0.021	0.006	3.429	**0.001**
	Δ MUFA (g)	0.043	0.012	3.691	**0.000**
	Δ PUFA (g)	0.032	0.011	2.907	**0.004**
	Δ SFA (g)	0.041	0.012	3.417	**0.001**
	F = 3.72, p = 0.002, R^2 = 0.155				
Δ PSQI Score	Constant	0.191	0.147	1.300	0.196
	Δ BMI (kg/m²)	0.437	0.217	2.013	**0.046**
	Δ Protein (g)	-0.020	0.009	-2.109	**0.037**
	ΔOmega-3 (g)	-0.326	0.133	-2.446	**0.016**
	Δ SFA (g)	0.054	0.018	3.014	**0.003**
	F = 4.066, p = 0.004, R^2 = 0.116				

There were no statistically significant differences in the consumption of most food groups between the lockdown and post-lockdown periods, with the exception of nuts and seeds (p=0.008). The participants consumed significantly more seeds during the lockdown period (Appendix 1).

4. Discussion

This longitudinal study was designed to assess changes in anthropometric measures, physical activity levels, sleep quality, emotional eating, psychological well-being and dietary status in a population isolated during the COVID-19 quarantine. The findings are expected to contribute to the literature by helping to anticipate lifestyle changes that may occur during quarantine or social lockdown.

The participants' body weight and BMI at the beginning of the lockdown period were significantly lower than those measured during the post-lockdown period. The time between these two phases was not sufficient for participants to lose the weight they had gained during lockdown. Although physical activity levels remained low in both periods, they were significantly lower during lockdown, likely due to restrictions that confined individuals indoors. Being confined at home can present a structural barrier to maintaining a physically active lifestyle (30), which may explain the changes observed in the anthropometric measures in this study. Similarly, meta-analyses studies examining the effects of the pandemic on body weight and BMI have reported increases in both body weight and BMI among participants (31, 32).

Sleep quality, as assessed by the PSQI, was poor during both periods, with no statistically significant difference between them. The combination of anxiety and stress triggered by the COVID-19 pandemic may have contributed to the decline in sleep quality (33). Other studies have also reported that lockdowns negatively affect sleep patterns, duration, and quality (34, 35). The continued poor sleep quality in the post-lockdown period observed in this study might be due to ongoing pandemic-related anxiety and stress. Although no significant difference was found in overall sleep scores between the two periods, a statistically significant but modest relationship (12%) was identified between changes in sleep scores and changes in protein, saturated fat and omega-3 fatty acid intake, and BMI. Increased intake of saturated fat and higher BMI were associated with poorer sleep, whereas increased intake of omega-3 and protein was positively associated with sleep quality. Poor sleep quality can lead to increased food intake and weight gain through hormonal changes such as lower leptin and higher ghrelin concentrations (36). Similar correlations between sleep quality and the intake of saturated fat (negative correlation), and omega-3 and protein (positive correlation), have been reported in other studies (37, 38). Although no statistically significant differences were found in overall energy, carbohydrate, protein, or fat intake between the two periods, the intakes of polyunsaturated fatty acids, omega-3 fatty acids, dietary fiber, and vitamin C were significantly higher during the lockdown period. While many studies report increased consumption of energy-dense, sugary, and fatty foods and decreased intake of milk products, fruits, and vegetables during the COVID-19 lockdown (39, 40), some have reported that approximately one-quarter of participants improved their diet quality, whereas others experienced deterioration (6, 41). Notably, most studies compare pre-pandemic and pandemic periods. This study, however, evaluated dietary behaviors between the lockdown and reopening phases of the pandemic. The observed differences in nutrient quality rather than quantity may be attributed to individuals' increased efforts to consume immune-supporting healthy foods due to fear of infection and anxiety about disease severity (42).

The PERMA well-being scores were significantly lower during lockdown. Analysis of the subdimensions revealed that this difference was largely due to increased negative emotions and feelings of loneliness. In the linear regression model evaluating the relationship between changes in PERMA scores and macronutrient intake, greater increases in carbohydrate, protein, monounsaturated fat, polyunsaturated fat, and saturated fat intake during the post-lockdown period were positively associated with improved well-being. Conversely, increased energy intake was negatively associated with changes in PERMA scores. These findings suggest that participants attempted to support their physical and mental well-being by consuming healthier foods during a time of distress. Although the effect was modest ($R^2 = 0.155$), nutrition appeared to influence well-being. Although published research on COVID-19 is still limited, studies have shown that well-being is associated with dietary habits and eating behaviors during the pandemic. For example, one study reported that emotional well-being was positively associated with fruit and vegetable intake, and negatively associated with unhealthy eating patterns (43). Another study demonstrated that lockdown periods were linked to lower levels of well-being, while well-being itself was related to positive mood and healthy dietary habits (44). Diets that are plant-based or rich in bioactive compounds such as omega-3 fatty acids, monounsaturated fats, and antioxidant vitamins have been reported to help alleviate COVID-19-related symptoms and support mental health (45, 46).

Apart from the increased consumption of oilseeds during the lockdown period, no significant differences were observed in the intake of other food groups. Similarly, during the lockdown period, increases were found only in the intake of polyunsaturated fats, omega-3 fatty acids, and dietary fiber. This may be attributed to the higher consumption of oilseeds. In addition, vitamin C intake was higher during lockdown, even though fruit and vegetable consumption did not significantly change. This may be explained by the fact that winter fruits such as oranges and tangerines, which are high in vitamin C, were consumed during the lockdown period, which occurred in the winter months, whereas summer fruits (e.g., apricots, melons, peaches) consumed later are typically lower in vitamin C (47). In a U.S.-based study with 3,000 participants, most individuals reported no changes in their consumption of the listed foods and beverages during lockdown and reopening periods. However, some participants reported increased intake of cookies, cakes, and snacks, and decreased consumption of vegetables, fruits, dairy, fish, chicken, and turkey (48). In Lebanon, a study with 1,137 participants reported increased consumption of fresh and frozen vegetables and fruits but decreased meat consumption (49). These cross-cultural differences may be due to differences in dietary habits. Moreover, Turkey's geographical and climatic characteristics make fresh produce highly accessible, which may have helped maintain fruit and vegetable consumption even during lockdown.

4.1. Limitations

This study has several limitations. First, dietary intake, sleep quality, and emotional well-being were assessed through self-reported data, which may be subject to recall bias and misreporting, despite efforts to enhance accuracy through phone interviews and meal photographs. Second, the study focused on a specific period of social isolation during the pandemic, which may limit the generalizability of the findings to non-pandemic conditions. Third, while macronutrient and micronutrient intakes were analyzed, broader dietary patterns were not assessed, which may have limited the ability to capture the holistic impact of diet on well-being.

5. Conclusion and Recommendations

This study provides valuable insights into the impact of the COVID-19 lockdown and post-COVID-19 lockdown periods on lifestyle factors, nutritional intake, and well-being among adult women in Turkey. Although there were no significant changes in total energy or macronutrient intake between the two periods, qualitative differences were observed, particularly in the increased consumption of omega-3 fatty acids, polyunsaturated fats, fiber, and vitamin C during the lockdown phase. These changes may reflect a conscious shift toward immune-supportive dietary behaviors in response to pandemic-related concerns.

Furthermore, both psychological well-being and sleep quality were found to be closely associated with changes in specific dietary components and BMI. Increased protein and omega-3 intake were positively associated with better sleep and well-being, whereas higher energy and saturated fat intake were linked to poorer outcomes. These findings underscore the multidimensional role of nutrition not only in physical health but also in mental and emotional resilience during times of crisis.

In conclusion, it is important not only to maintain a balanced intake of macronutrients but also to focus on the quality of dietary components to support mental health and sleep, particularly during periods of social and environmental stress such as lockdowns. According to these findings, public health strategies during pandemics or similar emergencies should consider integrating nutritional support and education alongside psychological and social interventions. Promoting a balanced diet rich in high-quality fats, proteins, and micronutrients may improve both physical and mental health outcomes in future lockdown scenarios.

6. Contribution to the Field

This study provides novel insights into how dietary quality, rather than quantity, influences sleep and psychological well-being during and after pandemic-related isolation. This is one of the few longitudinal analyses in adult women examining lifestyle shifts between the lockdown and reopening phases, offering valuable evidence to inform public health strategies in future crisis scenarios.

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Conflict of Interest

There are no conflicts of interest with any person and/or institution.

Authorship Contribution

Concept: ÖK, EK-1 (Ezgi Karataş), RNA; Design: ÖK, EK-1, RNA, EK-2 (Eda Köksal) Supervision: ÖK, EK-2; Funding: None; Materials: None; Data Collection/Processing: EK-1, RNA; Analysis/Interpretation: ÖK, EK-1, RNA; Literature Review: ÖK, EK-1; Manuscript Writing: ÖK, EK-1, RNA, EK-2; Critical Review: ÖK, EK-2.

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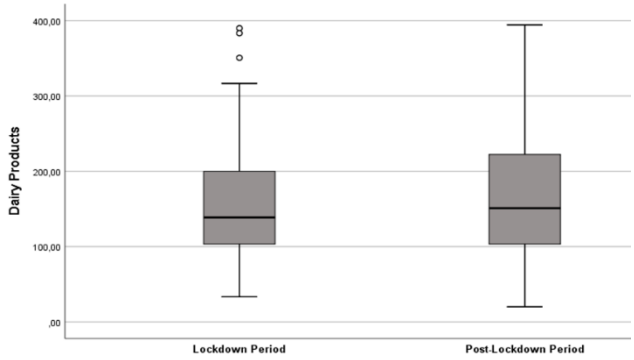
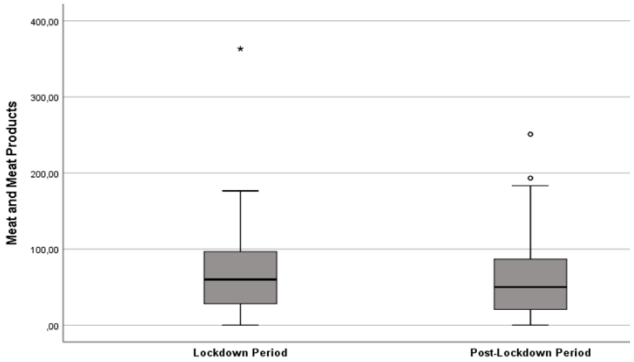
Appendix 1. Distribution graphs of food group consumption during the lockdown and post-lockdown periods

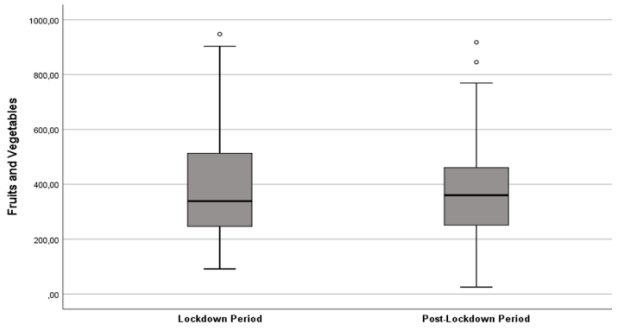
a) Dairy Products



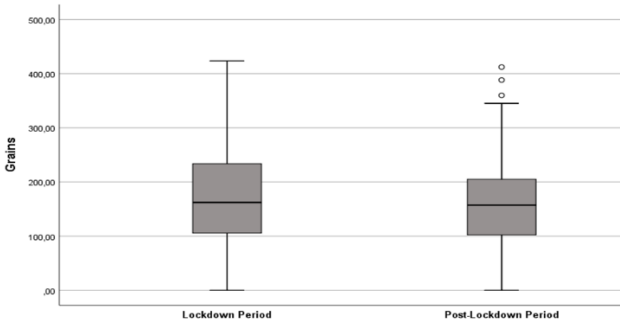
b) Meat and Meat Products



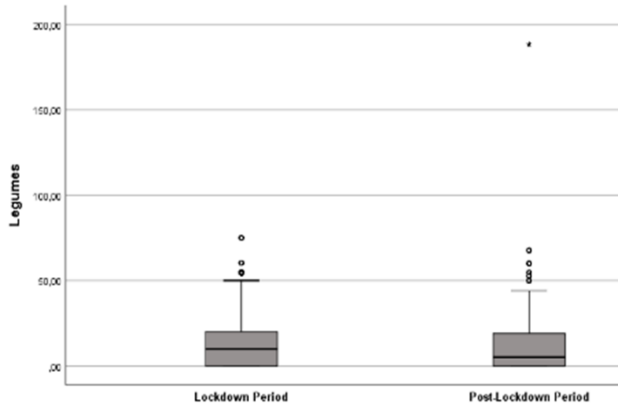
c) Fruits and Vegetables



d) Grains



e) Legumes



f) Nuts and Seed