Evaluation of the relationship between anxiety and nutritional habits in Turkish patients with multiple sclerosis during the Covid-19 outbreak

Avaliação da relação entre ansiedade e hábitos nutricionais em pacientes urcos com esclerose múltipla durante o surto da Covid-19

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ABSTRACT

Objective

The Coronavirus disease 2019 is a global public health problem that has led to psychological disorders (depression, anxiety, etc.), especially in fragile individuals such as those affected by multiple sclerosis. This study investigated the relationship between anxiety and nutritional habits during the Coronavirus disease 2019 outbreak in multiple sclerosis patients.

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Methods

This cross-sectional study was an online survey of multiple sclerosis patients living in Turkey. The total sample consisted of 294 multiple sclerosis patients. A questionnaire containing general demographic data, the Beck Anxiety Inventory, and nutritional attitudes and habits was applied to multiple sclerosis patients.

Results

Moderate or severe anxiety scores were found in 42.2% of multiple sclerosis patients. Weight gain was reported in 40.5% of them during the outbreak. A statistically significant difference was found in the distribution of individuals' Beck Anxiety Inventory scores for consumption of nuts/seeds, rice/pasta, cake/cookies, and water. A 1-unit increase in Beck Anxiety Inventory scores led to a 1.04 times increased consumption of bread and rice/pasta and a 1.05 times increased consumption of cake/cookies either before or after controlling for potential confounders. A 1-unit increase in Beck Anxiety Inventory scores led to a 1.06 times decreased consumption of water and a 1.04 times decreased consumption of meat and poultry, fruit (fresh), and rice/pasta, either before or after controlling for potential confounders.

Conclusion

During the Coronavirus disease 2019 outbreak, anxiety led to changes in multiple sclerosis patients' nutritional habits and food preferences. The continuous surveillance of psychological consequences and nutritional counseling during outbreaks should become routine as part of preparedness efforts worldwide.

Keywords: Anxiety. Covid-19 outbreak. Multiple sclerosis. Nutritional habits. Nutritional status.

R E S U M O

Objetivo

A doença do Coronavírus - 2019, causada pelo Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2), é um problema de saúde pública global e tem levado os indivíduos desenvolverem distúrbios psicológicos (depressão, ansiedade, etc.), especialmente indivíduos frágeis, como aqueles afetados por esclerose múltipla. O objetivo deste trabalho foi investigar a relação entre ansiedade e hábitos nutricionais em pacientes com esclerose múltipla durante o surto de coronavírus.

Métodos

Este estudo transversal é resultado de uma pesquisa online com pacientes com esclerose múltipla que vivem na Turquia (n=294). Um formulário de questionário contendo dados demográficos gerais, o Inventário de Ansiedade de Beck e atitudes e hábitos nutricionais foi aplicado a pacientes com esclerose múltipla.

Resultados

Escores de ansiedade moderados ou graves foram encontrados em 42,2% dos pacientes com esclerose múltipla. O ganho de peso foi relatado em 40,5% durante o surto. Foi encontrada diferença estatisticamente significativa na distribuição dos escores do Inventário de Ansiedade de Beck dos indivíduos para o consumo de nozes/sementes, arroz/massa, bolo/biscoitos e água. Um aumento de uma unidade nas pontuações do Inventário de Ansiedade de Beck levou a um aumento de 1,04 vezes no consumo de pão e arroz/massa e 1,05 vezes no consumo de bolo/biscoitos antes ou depois de controlar possíveis fatores de confusão. Um aumento de uma unidade nas pontuações do Inventário de Ansiedade de Beck levou a uma redução de 1,06 vezes no consumo de água e 1,04 vezes no consumo de carnes e aves, frutas (frescas) e arroz/massa antes ou depois de controlar possíveis fatores de confusão.

Conclusão

Durante o surto de coronavírus, a ansiedade levou a mudanças nos hábitos nutricionais e nas preferências alimentares dos pacientes com esclerose múltipla. A vigilância contínua das consequências psicológicas e o aconselhamento nutricional para surtos devem se tornar rotina como parte dos esforços de preparação em todo o mundo.

Palavras-chave: *Ansiedade. Surto de Covid-19. Esclerose múltipla. Hábitos nutricionais. Estado nutricional.*

I N T R O D U C T I O N

The Coronavirus disease (Covid-19) first appeared in December 2019 in Wuhan, in the Hubei Province, China. It was first reported to occur with an unknown etiology and was described as a pneumonia-like

disease with clinical symptoms such as fever, fatigue, dry cough, and respiratory distress [1,2]. Although the epidemic initially started in China, it spread rapidly around the world [3]. As of the 20th of September 2021, the number of confirmed cases worldwide had reached 241,411,380, including 4,911,112 deaths [4]. In Turkey, at the same date, 7,387,537 cases had been identified and 65,778 patients had died from Covid-19 [5]. However, in the data of the Health Ministry, there are no details regarding Multiple Sclerosis (MS) in patients during the Covid-19 outbreak.

In conjunction with its rapid transmission rates, the absence of specific preventive or therapeutic medical interventions for Covid-19 infection at this time requires individuals to take restrictive measures such as physical distancing and isolation to avoid exposure to the virus [6]. It has been reported by the Centers for Disease Control and Prevention (CDC) that patients with chronic diseases that cause immunosuppression and people using immunosuppressants are among the populations at a greater risk of an infection by Covid-19 [7]. The MS patients do not appear to be at an increased risk of contracting Covid-19 unless they use Disease-Modifying Therapies (DMT) that cause significant immunosuppression [6,8]. In addition, older MS patients and those with higher Expanded Disability Status Scale (EDSS) scores may be at higher risk for Covid-19 infection and complications [6].

During the Covid-19 outbreak, social isolation and quarantine practices have affected people's physical health and lives [9]. Quarantines and increased sedentary behaviors are harmful for basic functions such as mobility, cognition, and physical fitness, and reduce MS patients' quality of life [8,10]. Many studies have been conducted to evaluate the psychological state of the general population during the outbreak [11-14]. During the Covid-19 outbreak, in a cross-sectional study in China, 53.8% of 1,210 participants had moderate to severe psychological effects of the outbreak [1]. Another study reported that anxiety and stress disorder rates among health staff working were 23.0% and 27,0%, respectively [15]. Various studies have shown that MS patients have varying degrees of cognitive and neuropsychiatric involvement. Cognitive dysfunction affects 70.0% of MS patients and this condition may be present even in the early stages of the disease. The rates of anxiety and depression in MS patients were reported to be of 57% and 40.0%, respectively [16-18]. During the outbreak, MS patients have become particularly vulnerable to neuropsychiatric effects. During the Covid-19 outbreak, in a study conducted in Iranian MS patients, patients' average anxiety was found high [19]. Other studies conducted in MS patients showed that anxiety had increased compared to the period before the outbreak [20,21].

Psychological problems may reflect in changes in nutritional status and habits. The amount and type of food people eat may change under stress or when they are not mentally healthy [22-24]. It is thought that MS patients spend more time at home during quarantines, which decreases their physical activity, and there may be differences in nutritional habits due to the anxiety caused by the Covid-19 outbreak. t is important to consider the impact of lifestyle change, including unhealthy food preferences and nutritional habits, on the susceptibility to Covid-19 infection and recovery, especially in MS patients. To the best of our knowledge, there is no study examining the effect of anxiety on nutritional habits in MS patients during the outbreak. Therefore, the aim of the present study was to examine the relationship between anxiety and nutritional attitudes and habits during the Covid-19 outbreak in MS patients.

METHODS

In this cross-sectional study, an online survey questionnaire was openly accessible to the MS patients through MS associations' common local social websites and social media platforms such as Facebook, WhatsApp, and Instagram, from November 25 to December 30, 2020. The information was collected using a Google form questionnaire (Google Forms®). There were 294 MS patients who responded and answered

all the questions to the questionnaire that was shared in different MS social groups. Thus, 294 MS patients, whose ages ranged from 18 to 65 years, participated in the study.

In this study, in which MS patients participated on a voluntary basis, the informed consents were obtained from the participants in electronic form. The study was conducted in accordance with the established ethical procedures and the Declaration of Helsinki. Approval was obtained from Turkey's Health Ministry (n° 2020-05-28T09_39_43) and Ondokuz Mayıs University Clinical Research Ethics Committee (n° B.30.2.ODM.0.20.08/358) before the data collection started.

A questionnaire consisting of three sections was applied to the MS patients. The first section included the demographic data of the patients (such as sex, age, height, weight, educational status, marital status, working status, chronic illness, smoking, duration of MS, number of meals, weight change, use of dietary supplements, and physical activity status). The BMI was calculated by dividing the weight (in kg) by the square of the height (in meters) [25]. The second section included the 21 items of the Beck Anxiety Inventory. The third section included questions on the nutritional attitudes and habits (such as the number of meals, snacks, changes in food preferences), prepared by the researchers.

The Beck Anxiety Inventory (BAI) is a short anxiety inventory that focuses on the somatic symptoms of anxiety. It is an inventory that includes the assessment of how much they have been bothered by each symptom (such as irritability, dizziness, relaxation, and nervousness) over the past week. Since it always evaluated the previous week and it was carried out during the Covıd-19 outbreak, the anxiety status of the patients was evaluated with this scale. It is a 4-point Likert scale ranging from 0 (not at all) to 3 (severely anxious) and it consists of 21 items. The BAI was developed by Dr. Beck [26]. It was validated for the Turkish population by Ulusoy *et al.* [27]. The total score ranges from 0 to 63. The following guidelines are recommended for the interpretation of scores: 0–7, minimal anxiety; 8-15, mild anxiety; 16-25, moderate anxiety; and 26–63, severe anxiety.

A 32-item questionnaire was prepared by the researchers questioning the nutritional habits and attitudes of MS patients during the outbreak. These questions include eating habits, changes in food preferences (dairy products, meat and meat products, vegetables and fruits, cereals, beverages) regardless of financial considerations, and the number of main and snack meals. Participants were asked whether their consumption of dairy products, meat and meat products, vegetables and fruits, cereals, beverages increased, decreased or remained unchanged during the Covıd-19 outbreak.

Histograms, q–q plots, and the Shapiro–Wilk test were examined to assess the normality of the data. Levene's test was used to test variance homogeneity. The Kruskal–Wallis H test was applied to compare the distribution of BAI scores among food consumption categories. The Bonferroni adjusted Dunn test was used for post-hoc analysis. To examine the relationship between food consumption and BAI scores, Kendall tau-b correlation coefficients were also calculated. The coefficients were interpreted as follows: 0-0.30, very weak correlation; 0.31-0.50, weak correlation; 0.51-0.70, moderate correlation; 0.71-0.90, high correlation; and 0.91-1.00, very high correlation [28]. Since the proportional odds assumption of ordinal logistic regression analysis was not met, the binary logistic regression analysis models were built separately for increased and decreased food consumption to identify the influence of the BAI scores on the outcomes. Both crude and adjusted models were fitted. Adjusted models were built by controlling for the effect of age, sex, duration of MS disease, and BMI. To control for multiple testing, all p values were adjusted using the Benjamini–Hochberg procedure. Adjusted p values smaller than 5% were considered statistically significant. All analyses were conducted using the software R 3.5.1 <www.r-project.org> and TURCOSA (Turcosa Analytics Ltd. Co., Turkey <www.turcosa.com.tr>.

RESULTS

The effects of anxiety on nutrition were evaluated among 294 MS patients (n=235 women). The participants included 294 MS patients, whose ages ranged from 18 to 65 years. Table 1 shows the demographic characteristics of the MS patients. Their mean age was 31.89±8.89 years, 53.4% had a normal Body Mass İndex (BMI), and 42.2% had moderate and severe anxiety scores.

Table 1 – Basic demographic characteristics of the multiple sclerosis patients. Turkey, 2020.

Variables	Values
Age (years)	31.89±8.89
Sex (women)	235(79.9)
Body mass index (kg/m²)	23.89±4.66
Underweight (<18.50)	29(9.9)
Normal (18.50 – 24.99)	157(53.4)
Overweight (25.00 – 29.99)	80(27.2)
Obese (≥30.00)	28(9.5)
Duration of MS (years)	5(2-10)
Beck Anxiety Inventory scores	15.49±11.35
Minimal	93(31.6)
Mild	77(26.2)
Moderate	66(22.4)
Severe	58(19.8)
Chronic disease (present)	45(15.3)
Education level	
Primary school	5(1.7)
Secondary school	23(7.8)
High school	51(17.3)
Undergraduate or graduate	215(73.1)
Marital status (married)	140(47.6)
Current working status	
Not working	146(49.7)
Unpaid vacation	10(3.4)
Paid vacation	32(10.9)
Flexible overtime	46(15.6)
Working	50(17.0)
Dismissal	7(2.4)
Just started working	3(1.0)
Smoking (yes)	93(31.6)

Note: Values are expressed as n(%), M±SD.

Table 2 shows number of meals (before and during the outbreak), weight change, and use of dietary supplements during the Covid-19 outbreak. During the outbreak, 40.5% of the participants reported weight gain and 40.1% had no change in weight. The majority of patients consumed two main meals and a one snack meal (51.0% and 44.9%, respectively). Among the MS patients 31.1% of them used dietary supplements during the Covid-19 outbreak. The most commonly used dietary supplements were vitamin D, multivitamins, and vitamin C (11.4%, 7.6%, and 6.2%, respectively). The majority of patients (49.7%) were inactive or insufficiently active during the outbreak.

Table 3 shows the investigation of the relationship between food consumption and the BAI scores. A statistically significant difference was found in the distribution of patients' BAI scores for consumption of nuts/seeds, rice/pasta, cake/cookies, and water (*adj.p*<0.05). In patients with a high distribution of BAI

scores, the consumption of nuts/seeds and water decreased (*adj.p*<0.05) and the consumption of cake/cookies increased (*adj.p*<0.05). There was no difference among increased or decreased BAI scores for the rice/pasta consumption, but individuals with high BAI scores made a change in their rice/cake consumption compared to those with low scores (*adj.p*<0.05).

Table 2 – Nutritional and activity status of MS patients during the Covid-19 outbreak. Turkey, 2020.

Variables	n(%)
Number of main meals	
Before the Covid-19 outbreak	
1	6(2.0)
2	136(46.3)
3	149(50.7)
>3	3(1.0)
During the Covid -19 outbreak	
1	12(4.1)
2	150(51.0)
3	121(41.2)
>3	11(3.7)
Number of snacks	
Before the Covid -19 outbreak	
1	2(0.7)
2	148(50.3)
3	110(37.4)
>3	34(11.6)
During the Covid -19 outbreak	
1	132(44.9)
2	115(39.1)
3	37(12.6)
>3	10(3.4)
Weight change during the Covid -19 outbreak	
Weight gain	119(40.5)
Weight loss	57(19.4)
No change	118(40.1)
Dietary supplements (using)	95(32.3)
Vitamin B$_{12}$	10(3.4)
Vitamin D	37(12.6)
Vitamin C	22(7.5)
Multivitamin	23(7.8)
Iron	3(1.0)
Zinc	7(2.4)
Magnesium	9(3.1)
Omega 3	17(5.8)
Biotin	3(1.0)
Coenzyme 10	1(0.3)
Lactoferrin	2(0.7)
Black elderberry	4(1.4)
Bromelain	1(0.3)
Kefir	3(1.0)
Probiotic	7(2.4)
Propolis	5(1.7)
Reishi mushroom	2(0.7)
Turmeric	2(0.7)
Physical activity status during the Covid-19 outbreak	
Inactive or Insufficiently active	146(49.7)
Lightly active	94(32.0)
Moderate active	42(14.3)
Highly active	12(4.0)

Table 3 – Investigation of the relationship between food consumption and the Beck Anxiety Inventory scores. Turkey, 2020.

Foods	Beck Anxiety Inventory scores				
	Food Consumption			adj.p	Kendall tau-b
	Decreased	Unchanged	Increased		
Dairy Products					
Yoghurt	11(4-21)	14(6-24)	12(6-20)	0.445	-0.022
Kefir	17.5(6-30)	13(6-22)	14(9-23)	0.617	-0.009
Cheese	14(6-32)	13(6-23)	13(7-20)	0.617	-0.035
Meat and Meat Products					
Meat	16(9-26)	12(6-21)	14(7.5-23.5)	0.100	-0.016
Poultry	18(9-26)	12(6-20)	15(7-25.5)	0.105	-0.004
Fish	14(9-29)	13(6-21)	14(7-23.5)	0.397	-0.018
Egg	13(6-26)	12(6-22)	15(7-24)	0.397	0.049
Legume	11(9-26)	13(6-22)	14(6-23)	0.617	-0.005
Nuts-seeds	19.5(10-31)[a]	13(6-21)[b]	13(6.5-23.5)[b]	**0.025**[*]	-0.069
Vegetables and Fruits					
Dark Green Vegetables	14(6-26)	13(6-21)	14(7-23)	0.559	0.030
Other Vegetables	18(9-27)	13(6-21)	14(7-23)	0.460	-0.009
Fruit (fresh)	19.5(12-27)	12(6-20.5)	14(7-24)	0.105	0.001
Fruit (dry)	17(10-27)	13(6-22)	12.5(6-24)	0.298	-0.035
Cereals					
Bread	14.5(7-24)	12(6-20)	16(9-26)	0.105	0.001
Rice-pasta	16.5(9-26)[a]	11.5(5-19)[b]	16(7.5-26.5)[a]	**0.005**[**]	-0.051
Cake-cookies	12(6-24)[a]	12(5-19)[a]	19(9.5-26.5)[b]	**0.020**[*]	0.088
Dessert	12.5(6-23)	13(5-20)	19(7-26)	0.192	0.049
Beverages					
Tea	21(7-32)	13(6-23)	13(7-20)	0.397	-0.047
Coffee	14(7-28)	13(5-20)	15(7-23)	0.171	0.008
Water	21(13-29)[a]	11(5-19)[b]	14(7-24)[b]	**0.005**[***]	-0.007

Note: Values are expressed as median. [a,b]Different superscripts in the same row indicate a statistically significant difference between groups. Kendall tau-b coefficient is significant at adj.p <0.05 ([*]), adj.p <0.01 ([**]), adj.p <0.001 ([***]). All significant adjusted p-values are shown in bold.

Table 4 shows the binary logistic regression results in identifying the influence of the BAI scores on increased and decreased food consumption. A 1-unit increase in BAI scores affected 1.04 times the increased consumption of bread and rice-pasta, and 1.05 times the increased consumption of cake-cookies either before or after controlling for potential confounders (age, sex, duration of MS disease, BMI) (adj. p<0.05). A 1-unit increase in the BAI scores affected 1.06 times the decreased consumption of water and 1.04 times the decreased consumption of meat and poultry, fruit (fresh), rice-pasta, either before or after controlling for potential confounders (age, sex, duration of MS disease, BMI) (adj.p<0.05). A 1-unit increase in the BAI scores affected 1.03 times the decreased consumption of tea and coffee (adj.p<0.05). When the effect of age, sex, duration of MS disease, and BMI variables are adjusted, this effect is 1.04 times for tea (adj.p<0.05).

DISCUSSION

The widespread effects of the Covid-19 outbreak, including measures taken by the community and health systems, have deeply affected people living with chronic diseases such as those affected by MS. The aim of the present study was to investigate the effect of anxiety on the nutritional habits of MS patients

Table 4 – Binary logistic regression results identifying the influence of the Beck Anxiety Inventory scores on increased and decreased food consumption. Turkey, 2020.

Foods	Increased Food Consumption				Decreased Food Consumption			
	Crude		Adjusted*		Crude		Adjusted*	
	OR (95%CI)	adj.p	OR (95%CI)	adj.p	OR (95%CI)	adj.p	OR (95%CI)	adj.p
Dairy Products								
Yoghurt	0.98(0.96-1.01)	0.173	0.98(0.96-1.01)	0.109	0.98(0.95-1.02)	0.352	0.99(0.95-1.03)	0.577
Kefir	0.99(0.97-1.03)	0.944	0.99(0.97-1.03)	0.847	1.02(0.99-1.05)	0.231	1.02(0.99-1.05)	0.214
Cheese	0.99(0.97-1.02)	0.553	0.99(0.96-1.03)	0.268	1.02(0.99-1.06)	0.180	1.02(0.99-1.06)	
Meat and Meat Products								
Meat	1.02(0.99-1.04)	0.138	1.02(0.99-1.04)	0.209	1.04(1.01-1.07)	**0.007**	1.04(1.01-1.07)	**0.005**
Poultry	1.03(0.99-1.05)	0.059	1.02(0.99-1.05)	0.107	1.04(1.01-1.06)	**0.010**	1.04(1.01-1.07)	**0.011**
Fish	1.01(0.98-1.03)	0.529	1.00(0.98-1.03)	0.737	1.02(0.99-1.05)	0.113	1.02(0.99-1.06)	0.104
Egg	1.02(0.99-1.04)	0.178	1.01(0.99-1.04)	0.326	1.02(0.99-1.05)	0.295	1.02(0.99-1.05)	0.231
Legume	1.01(0.98-1.03)	0.638	1.00(0.97-1.03)	0.970	1.02(0.99-1.06)	0.148	1.03(0.99-1.06)	0.126
Nuts-seeds	1.01(0.98-1.03)	0.574	1.00(0.98-1.03)	0.959	1.06(1.02-1.09)	**<0.001**	1.06(1.03-1.09)	**<0.001**
Vegetables and Fruits								
Dark Green Vegetables	1.01(0.99-1.03)	0.279	1.01(0.99-1.03)	0.364	1.02(0.98-1.06)	0.293	1.02(0.98-1.06)	0.361
Other Vegetables	1.01(0.98-1.03)	0.690	1.00(0.98-1.03)	0.829	1.03(0.99-1.06)	0.126	1.03(0.99-1.06)	0.103
Fruit (fresh)	1.01(0.99-1.04)	0.219	1.01(0.99-1.03)	0.428	1.04(1.00-1.08)	**0.037**	1.04(1.00-1.08)	**0.030**
Fruit (dry)	1.00(0.98-1.03)	0.777	1.00(0.97-1.02)	0.743	1.03(0.99-1.06)	0.099	1.02(0.99-1.05)	0.171
Cereals								
Bread	1.04(1.01-1.07)	**0.014**	1.04(1.01-1.07)	**0.017**	1.02(0.99-1.05)	0.062	1.02(0.99-1.04)	0.161
Rice-pasta	1.04(1.01-1.07)	**0.007**	1.04(1.01-1.07)	**0.010**	1.04(1.02-1.07)	**0.001**	1.04(1.01-1.06)	0.004
Cake-cookies	1.05(1.02-1.08)	**0.001**	1.05(1.02-1.08)	**0.002**	1.02(0.99-1.04)	0.146	1.01(0.99-1.04)	0.325
Dessert	1.03(0.99-1.05)	0.055	1.02(0.99-1.05)	0.095	1.01(0.99-1.03)	0.425	1.01(0.98-1.03)	0.557
Beverages								
Tea	0.99(0.97-1.02)	0.658	0.99(0.96-1.01)	0.250	1.03(1.00-1.06)	**0.031**	1.04(1.01-1.07)	**0.013**
Coffee	1.02(0.99-1.04)	0.160	1.02(0.99-1.04)	0.221	1.03(1.00-1.06)	**0.048**	1.02(0.99-1.05)	0.108
Water	1.02(0.99-1.05)	0.057	1.02(0.99-1.04)	0.175	1.06(1.03-1.10)	**0.001**	1.06(1.02-1.11)	**0.001**

Note: *Adjusted by age, sex, duration of MS disease, body mass index. CI: Confidence Interval; OR: Odds Ratio. All significant variables are shown in bold.

during the Covid-19 outbreak in Turkey. Moderate and severe anxiety scores were found in 42.2% of the patients included in the study. In the absence of a pandemic, MS patients have reported psychological disorders such as anxiety and depression. Previous studies showed that the anxiety rates in MS patients generally range from 14% to 41% [29]. In a cross-sectional study with MS patients, Talaat *et al.* [30], found that 62% of the patients had anxiety during the Covid-19 outbreak (5.2% mild, 19.1% moderate, 8.7% severe, and 28.7% extremely severe).

Psychological problems such as depression, anxiety, and stress affect the dietary intake, but it is not entirely clear by which mechanisms (genetic, hormonal, immunological, etc.) this effect occurs [31]. Nutritional habits such as the food preferences and shopping behavior of the general population changed, also affected by psychological problems such as fear and anxiety during this period in Turkey [32]. Scarmozzino and Visioli showed that 42.7% of the reasons for the change in nutrition were stress, anxiety, and boredom [33].

In the present study, 49.7% of the patients were inactive or insufficiently active during the outbreak. In another study, 33.3% of the MS patients in the pandemic decreased their activity compared to the pre-pandemic period [34]. The present study found that 40.5% of the patients gained weight and 40.1% of them had no change in weight. In Italy, 19.5% of the healthy adults had an increase in weight during the Covid-19 outbreak [33]. In a study of 312 healthy people in which the BMI classification was not changed,

the majority of individuals (50.8%) had a normal BMI and 45.86% reported that they gained weight during the outbreak [35]. In the present study, most MS patients consumed two main meals and a one snack meal (51.0% and 44.9%, respectively). In a study of 1,047 participants who were healthy or had cardiovascular problems, who were evaluated with international participation, it was shown that two main meals were consumed frequently (44.0%) during the Covid-19 outbreak [36]. In another study, individuals consumed a total of four meals (40.7%) [35]. The implementation of quarantine practices imposed in countries during the outbreak led people to spend more time at home. This is thought to have caused changes in the number of meals due to the decrease in physical activity and changes in routine sleep times. We found that 31.1% of MS patients used dietary supplements during the Covid-19 outbreak (most commonly vitamin D, multivitamins, and vitamin C). Another study showed that healthy people used vitamin D (13.5%), magnesium (10.3%), and group B vitamins (8.7%) during the outbreak [35]. The inclusion of dietary supplements in the treatment and prevention of Covid-19 on the news and social media platforms indicates people's growing preference for these supplements [37].

In the present study, we found significant differences in the distribution of BAI scores for the consumption of nuts/seeds, rice/pasta, cake/cookies, and water. A high distribution of BAI scores was associated with a decreased consumption of nuts/seeds and water and increased consumption of cake/cookies. We found that high BAI scores caused a change in the consumption of rice/cake. An increase in BAI scores led to an increased consumption of bread, rice/pasta, and cake/cookies; and to the decreased consumption of water, meat, poultry, fruit (fresh), rice/pasta, tea, and coffee either before or after controlling for potential confounders. A Turkish adult cohort study with 1012 adults conducted by Kaya *et al.* [32], showed a significant correlation between the anxiety score and the consumption of cheese, legumes, nuts/seeds, cake/cookies, sweets, and tea. In other studies, it has been shown that anxiety affects nutritional habits and attitudes [38,39]. For this reason, it is thought that physical activity and nutritional interventions may also have a beneficial effect in optimizing mental health.

This study has several important results. To the best of our knowledge, this study is the first study to examine the relationship between anxiety and nutritional habits during the Covid-19 outbreak in MS patients. The sample is generally relatively heterogeneous and large among Turkish MS patients. However, some limitations deserve mentioning. First, the nature of our study was cross-sectional and therefore no conclusion about causality can be drawn. Second, this study was conducted via an online survey and is based on individual statements. Plus, patients could not be interviewed face to face due to the outbreak, and only patients who have access to online platforms could be contacted. Third, the survey respondents were mostly women, and their nutritional status were not evaluated clinically.

C O N C L U S I O N

During the Covid-19 outbreak, anxiety led to changes in MS patients' nutritional habits and food preferences. Continuous surveillance of psychological consequences and nutritional counseling for outbreaks should become routine as part of preparedness efforts worldwide. Healthcare organizations can provide professional therapeutic advice, psychosocial support, and nutritional counseling for this population of patients during outbreaks.

CONTRIBUTORS

S KAYA and Z UZDİL contributed the conceptualization, methodology, investigation and writing. G ZARARSIZ was responsible for the statistical analysis. P SÖKÜLMEZ KAYA was responsible for the investigation and editing. M TERZİ was responsible for the conceptualization, project administration, validation and supervision.

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