COVID-19 pandemic in Istanbul: Seizure frequency and psychosocial outcomes in patients with epilepsy

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Abstract

Objective: The aim of this study was to examine seizure frequency and psychosocial outcomes in patients with epilepsy (PwE) during the COVID-19 pandemic. *Methods:* This cross-sectional case-control study included 319 adult PwE and 327 healthy controls (HC). The data were collected using a patient/person information form, Worry and Anxiety Questionnaire (WAQ), Beck Depression Inventory (BDI-II), and the Pittsburg Sleep Quality Index (PSQI). *Results:* Seventy-four (23.1%) patients had an increase in seizure frequency during the pandemic. The mean age of PWE with increased seizure frequency (ISF) was lower (32.8±9.3) than PWE with unchanged seizure frequency (USF) (37.0±11.4). When psychosocial impacts of the pandemic were compared between the groups, the ISF group was psychologically affected more than the USF and HC groups. WAQ and BDI-II scores were higher in ISF than USF and higher in USF than HC group. Also, the analysis revealed that the seizure frequency during the pandemic was almost similar before the pandemic. However, only those who had frequent seizures before the pandemic had worsened seizure frequency during the pandemic. The analysis showed that factors such as having trouble in drug supply, having more than 4-6 seizures in a year, worrying about seizure intervention, and being depressed, were related to being psychologically affected by the pandemic.
Conclusion: It was observed that the psychosocial outcomes during the pandemic were worse in PwE than healthy controls, especially in those with increased seizure frequency. Therefore, it is essential to increase the medical and psychosocial support to PwE during the pandemic.

Keywords: Epilepsy, COVID-19, seizure frequency, psychosocial outcomes, mental health

INTRODUCTION

The COVID-19 outbreak, which emerged in the city of Wuhan, China, towards the end of 2019, spread all over the world, and the first case was reported in Turkey on the date WHO declared a pandemic (11 March 2020).[1] In order to manage it, many measures have been taken in Turkey as well as all over the world, and serious restrictions have been imposed on the whole society.[2] When the pandemic's social, psychological, and economic burdens were added to the fear of being infected with the virus, the effects of the pandemic reached a traumatic level.[3] Therefore, in a situation where even healthy individuals are deeply affected, it can be expected that patients with epilepsy (PwE) who have to go to the hospital and obtain their medicines regularly to keep their seizures under control would experience more distress during the pandemic.[4] Many factors such as unpredictable seizures, difficulties in responding to seizures, prejudices against epilepsy, insufficient knowledge, and negative attitudes about epilepsy already cause substantial psychosocial distress regardless of the pandemic.[5-7] Therefore, it is inevitable that the high level of psychosocial distress in patients will increase during the pandemic due to reasons such as interruption of routine outpatient clinic services,

problems in accessing drugs, lack of remote health care services, and fear of having more frequent or severe seizures.[8-10] The negative effects of the COVID-19 pandemic were not limited to these mentioned; but also forced patients into a long-duration home quarantine as in the whole society. Increased time spent at home has changed the routines of PwE, disrupted their sleep patterns, and caused social isolation.[11-14] With the addition of economic problems to all these negativities, the devastating effect of the COVID-19 pandemic has been even greater.[15] Although PwE often manages to protect themselves from being infected with the COVID-19, it is not possible to say the same things for the psychosocial effects. Therefore, it is essential to examine the effects of the COVID-19 pandemic on PwE in detail and address psychosocial factors. This study aimed to examine seizure frequency and psychosocial outcomes in PwE during the COVID-19 pandemic.

METHODS

Study design and participants

This cross-sectional case-control study was conducted with adult PwE attending a tertiary epilepsy outpatient clinic in Istanbul. The inclusion criteria for the study were being older than 18 and having a definite diagnosis of epilepsy. Patients who had other serious chronic diseases (cardiovascular disease, cancer, and major depression) were excluded from the study. There were no inclusion/exclusion criteria regarding the seizures of the patients who were invited to the study. Those with resistant seizures, no seizures in the last two years, or less than one seizure per month, etc. all patients were included in the study. The study forms were sent to 4861 PwE registered in the epilepsy outpatient clinic electronically via e-mail or other communication applications, and 319 PwE completed the survey. Data collection was carried out when the deaths due to COVID-19 showed a peak in Turkey, between 15 December 2020 and 5 January 2021. In addition, 327 individuals from the general population, older than 18 and did not have a health problem, were included in the study as a control group (HC). A snowball sampling method was used to access controls.

Measures

A patient information form was used to examine the sociodemographic and clinical characteristics of the patients, the frequency of seizures, and the psychosocial effects of the pandemic on the patients. In addition, the Worry and Anxiety Questionnaire (WAQ), the Beck Depression Inventory (BDI-II), and the Pittsburg Sleep Quality Index (PSQI) were used to evaluate psychosocial outcomes. Considering their seizure frequency before and during the pandemic, the patients were grouped as PwE with increased (PwE with ISF) or unchanged seizure frequency (PWE with USF) to make comparisons.

Sociodemographic, clinical and psychosocial characteristics, and seizure frequency

Among the sociodemographic characteristics, age, gender, educational level, marital status, and employment status were questioned. Among the clinical features, age at onset of epilepsy, duration of illness and the number of antiepileptic drugs used were evaluated. To determine the patients' seizure frequency, we asked an item with a 5-point Likert-type response "What was your seizure frequency during the 1 year before the pandemic?". Participants responded to this item by considering the period between March 2019, when the first COVID-19 case was observed in Turkey, and December 2020, when the data was gathered for this study. For pre-pandemic, they respond to considering the period before the first case report in Turkey. We also asked the same question for the period of the pandemic. To examine the epilepsy-related worries or problems during the pandemic, questions such as "Are you worried about seizure intervention?" and "Do you have problems supplying your antiepileptic drugs?" were asked. To examine the negative effects of the COVID-19 on various aspects of life, the question "Which areas of your life have been affected negatively by the pandemic?" was asked.

Mental health and sleep quality

Worry and Anxiety Questionnaire (WAQ): This 11-item questionnaire, developed by Dugas *et al*. (2001)[16] measures whether or not an individual has a generalized anxiety disorder. The scores that can be obtained range between 0 and 80. High scores indicate high worry and anxiety. The scale validation was made by Akyay (2016)[17] and Cronbach`s alpha value was 0.89.

Beck Depression Inventory-II (BDI-II): The scale was developed by Beck *et al*. (1996) to measure the severity of the depressive mood.[18] The BDI-II consists of 21 items. The range of scores obtained

from the scale varies between 0 and 63. For the Turkish population, the cut-off point was reported to be 17, and Cronbach`s alpha coefficient was 0.90.[19]

Pittsburgh Sleep Quality Index (PSQI): This scale, which evaluates sleep quality, consists of 24 items. The total score obtained from the scale is 0-21, and a score greater than 5 indicates "poor sleep quality." It was developed by Buysee *et al*. (1989)[20] and adapted to Turkish by Agargun et al. (1996).[21]

Statistical analysis

The sociodemographic and clinical variables of the patients were given as numbers and percentages. Chi-square test was used to compare categorical variables, and independent samples t-test and ANOVA tests were used to compare continuous variables. In addition, the Gamma test was used to compare the frequency of seizures before and during the pandemic. The non-linear canonic correlation (OVERALS) technique was used to show the relationships among different variable sets on the graph. The OVERAL locates the categories of variables in a low dimensional space according to their proximity. SPSS (V21.0, IBM) was used to analyze the data.

Ethical considerations

The Ethical Board of the Istanbul University (No: 29624016-050.99-1291) approved the study. Informed consent was obtained from the patients by asking for their voluntary participation in the study on the first page of the online forms.

RESULTS

The mean age of 319 PwE was 36.0 (11.1), and about half of them (49.8%) had a university degree (Table 1). About a quarter (23.2%) of the patients reported an increase in their seizures, 67.4% no change in their seizures, and 9.4% a decrease in seizures during the pandemic period (data not shown in the tables). There was no difference between the three groups regarding sociodemographic, except for age (Table 1).

The mean age of disease onset was 19.8 (±11.7), and the disease duration was 16.0 (±10.4) years. It was determined that 18.8% of the patients had problems in drug supply during the pandemic, about half of them (47.6%) had worried about intervening to seizures at home, and 22.3% had more than one seizure per month. The age of disease onset of the PWE with USF was higher than the ISF (t_{317}=3.17, p<0.001). In addition, the ISF group had more difficulty supplying drugs and was more worried about seizure intervention than the USF (Table 2). Table 3 list the pre- and post-pandemic seizure frequency.

Since the variables that compare the frequency of seizures before and during the pandemic are ordinal, the Gamma test examined relationships among them. The Gamma value close to 1 indicates a strong relationship between the two ordinal variables, such as the frequency of seizures in epilepsy.

When asked about the effects of the pandemic

Table 1: Sociodemographic characteristics of the participants

Variable	Total PwE n (%)	USF n (%)	ISF n (%)	Control n (%)	F /χ²
Age (Mean, SD)	36.0 (11.1)	37.07 (11.46)	32.81 (9.32)	35.08 (10.20)	5.29*
Gender					
Female	150 (47.0)	115 (46.9)	35 (47.3)	160 (48.9)	0.02
Male	169 (53.0)	130 (53.1)	39 (52.7)	167 (51.1)	
Marital status			35 (47.3)		
Single/ divorced/ widow	123 (38.6)	88 (35.9)	39 (52.7)	106 (32.4)	0.10
Married	196 (61.4)	157 (64.1)		221 (67.6)	
Education					
Primary education	60 (18.8)	50 (20.4)	10 (13.5)	62 (19)	0.09
Secondary education	100 (31.3)	79 (32.2)	21 (28.4)	88 (26.9)	
University	159 (49.8)	116 (47.3)	43 (58.1)	177 (54.1)	

Note: PwE: Patients with epilepsy, USF: Unchanged/decreased seizure frequency, ISF: Increased seizure frequency, Control: Healthy Individuals
ANOVA test was used to compare age, and Chi-square test was used to compare other variables.
*p<0.05

Table 2: Clinical characteristics of the patients

Variables	Total PwE n (%)	USF n (%)	ISF n (%)	t / χ^2
Epilepsy duration (years) (Mean, SD)	16.02 (10.6)	15.67 (10.4)	17.21 (11.3)	-1.10
Age at onset (Mean, SD)	19.87 (11.7)	21 (11.8)	16.15 (10.3)	3.17**
Type of therapy				
Monotherapy	152 (47.6)	130 (53.1)	22 (29.7)	12.4**
Polytherapy	167 (52.4)	115 (46.9)	52 (70.3)	
Trouble in drug supply during the pandemic				
Yes	60 (18.8)	33 (13.5)	27 (36.5)	0.24**
No	259 (81.2)	212 (86.5)	47 (63.5)	
Worrying about seizure intervention during pandemic				
Yes	152 (47.6)	98 (40.0)	54 (73.0)	0.27**
No	167 (52.4)	147 (60.0)	20 (27.0)	
Remote support without going to the hospital				
Yes	80 (25.1)	64 (26.1)	16 (21.6)	0.04
No	239 (74.9)	181 (73.9)	58 (78.4)	
Pre-pandemic seizure frequency				
Free	174 (54.5)	156 (63.7)	18 (24.3)	
Twice or six times a year	74 (23.2)	54 (22.0)	20 (27.0)	46.8**
Once a month or more	71 (22.3)	35 (14.3)	36 (48.6)	

Note: PwE: Patients with epilepsy, USF: Unchanged/decreased seizure frequency, ISF: Increased seizure frequency
Independent samples t-test was used to compare continuous variables; Chi-square test was used to compare categorical variables.
** p<0.001

by the question "Which areas of your life have been affected negatively by the pandemic?", the participants stated that the pandemic most affected the social and psychological areas of their lives (79.9% and 67.1% for patients, 89.6% and 67.3% for controls, respectively). However, the ISF group reported more problems in social life than the USF and in psychological status compared to both groups. Economically, the only difference was between the USF and the control groups. In addition, the ANOVA test showed significant differences among WAQ and the BDI-II scores of the groups ($F_{2,643}$=18.92 and 48.03, p<0.001, =0.06 and 0.13, respectively). Partial eta squares showed that the group effect was moderate in the WAQ but high in the BDI-II (post-hoc tests confirmed that WAQ and BDI-II scores were higher in the ISF than the USF, and the USF than the control group (Table 4).

In our study, to investigate the relationships among variables OVERALS technique was used. The antecedent variables consisted of therapy type, duration of epilepsy, pre-pandemic seizure frequency, trouble in drug supply, worrying about seizure intervention, and remote support from the hospital. Outcome variables included social, economic, psychological, physical consequences, seizure frequency during the pandemic, anxiety, depression, and sleep problems. OVERALS showed the relationships between the antecedent and outcome variables (Table 5).

Table 3: Pre- and post-pandemic seizure frequency among patients

Pre-pandemic / Post-pandemic	No seizure	Twice a year	4-6 times a year	1 per one month	>1 per one month	χ^2
No seizure	155 (89.1)	10 (28.6)	4 (10.3)	1 (4.8)	0 (0)	
Twice a year	15 (8.6)	15 (42.9)	5 (12.8)	1 (4.8)	0 (0)	
4-6 times a year	2 (1.1)	7 (20)	18 (46.2)	0 (0)	3 (6)	0.93**
One per one month	0 (0)	1 (2.9)	7 (17.9)	6 (28.6)	4 (8)	
>One per one month	2 (1.1)	2 (5.7)	5 (12.8)	13 (61.9)	43 (86)	

**p<0.001

Table 4: Distribution of reported psychosocial problems and means of anxiety, depression and sleep scale scores in patient and control groups during the pandemic

Variables	Total PwE	USF n (%)	ISF n (%)	Control n (%)	F /χ²
Negative social impact					
Yes	255 (79.9)	189 (71.1)	66 (89.2)	293 (89.6)	0.17**
No	64 (20.1)	56 (22.9)	8 (10.8)	34 (10.4)	
Negative economic impact					
Yes	131 (41.1)	94 (38.4)	37 (50.0)	160 (48.9)	0.11*
No	188 (58.9)	151 (61.6)	37 (50.0)	167 (51.1)	
Negative psychological impact					
Yes	214 (67.1)	155 (63.3)	59 (79.7)	220 (67.3)	0.10*
No	105 (32.9)	90 (36.7)	15 (20.3)	107 (32.7)	
Negative physical impact					
Yes	39 (12.2)	29 (11.8)	10 (13.5)	35 (10.7)	0.03
No	280 (87.8)	216 (88.2)	64 (86.5)	292 (89.3)	
WAQ (Mean, SD)	40.20 (20.61)	38.28 (20.94)	46.58 (18.22)	31.51 (20.92)	18.92**
BDI-II (Mean, SD)	16.47 (11.19)	14.55 (10.16)	22.82 (12.15)	10.83 (8.66)	48.03**
PSQI (Mean, SD)	11.45 (34.88)	9.52 (15.27)	10.83 (11.80)	7.86 (13.94)	1.77

Note: PwE: Patients with epilepsy, USF: Unchanged/decreased seizure frequency, ISF: Increased seizure frequency, Control: Healthy Individuals

ANOVA test was used to compare continuous variables; Chi-square test was used to compare categorical variables.
*$p<0.05$, **$p<0.001$

The coefficients on the dimension columns in Table 5 are the coordinate values of the variables in Figure 1. The weights also indicate the correlations of the variables with the dimensions Table 5 also demonstrates that the average loss, the variance ratio that cannot be explained by the weighted combination of variables, is 0.05 for the 1st dimension and 0.26 for the 2nd dimension. Small loss values showed large multiple correlations between weighted sums of optimally scaled variables and dimensions. Subtracting the average losses from 1, the relationship (eigenvalues) indicated by the dimensions is obtained. Accordingly, the relationship shown in the 1st dimension is 0.95, and the 2nd dimension is 0.74. The total fit obtained by summing up the eigenvalues is 1.68. Since the highest value of fit for this analysis is two and values below 0.5 are considered as the threshold[22], 1.68 can be considered sufficient. Both the weights used to obtain the optimally scaled variables and the loadings showing the correlations between optimally scaled variables and the variables demonstrate that "pre-pandemic seizure frequency" in set 1 and the "seizure frequency during the pandemic" set are most correlated to the 1st dimension and that they contribute to the fit coefficient. Furthermore, "trouble in drug supply during the pandemic," "worrying about seizure intervention," "psychological consequences," and "depression" are mostly associated with

dimension two and contribute to its fit. The fact that the single loss values are zero except for "the duration of epilepsy" indicates that there is no need to change the variables' scale levels. Since the figure's readability improves, the centroid plot presented in Figure 1 does not include variables that contribute little to the dimensions, essentially spread around the origin. Figure 1 reveals that the seizure frequencies are closely positioned in the pre-pandemic and during the pandemic period. This proximity indicates that the seizure frequency did not increase during the pandemic. Besides, the dimension of seizure separates "seizure-free" and "having two seizures" from "having 4-6 seizures" and "having more than 12", while the psychological outcome distinguishes those (depressives, having trouble in drug supply during the pandemic, worrying about seizure intervention, and psychologically affected) on one side of the chart from the other. The dimensions together exhibit that having trouble in drug supply, having more than 4-6 seizures in a year, worrying about seizure intervention and being depressive, were related to being affected psychologically.

DISCUSSION

Seizure control in epilepsy patients is the most basic issue, as individuals with epilepsy who cannot control seizures are more exposed to the biopsychosocial effects of epilepsy. Therefore,

Table 5: Counts (percentages), weights, loadings, total losses, eigenvalues, and fit values of the variable categories

| Variables/categories	Count (%)	Weight 1	Dimension 1	Weight 2	Dimension 2	Sum of Single loss
1. Therapy type		.01	-.45	-.08	-.12	.00
Monotherapy	152 (48)					
Polytherapy	167 (52)					
2. Duration of epilepsy (year)	1 - 56	-.01	-.09	-.09	-.13	.05
3. Pre-pandemic seizure frequency		-.93	-.96	-.27	-.11	.00
Free	174 (55)					
Twice a year	35 (11)					
Four or six times a year	39 (12)					
Twelve times a year or more	71 (22)					
4. Trouble in drug supply during the pandemic		.03	.20	-.39	-.50	.00
Yes	60 (19)					
No	259 (81)					
5. Worrying about seizure intervention		.11	.34	-.61	-.67	.00
Yes	152 (48)					
No	167 (52)					
6. Remote support without going to the hospital		-.05	-.13	.22	.37	.00
Yes	80 (25)					
No	239 (75)					
7. Social consequences		-.05	.00	-.17	-.07	.00
Yes	255 (80)					
No	64 (20)					
8. Economic consequences		.00	.05	-.24	-.37	.00
Yes	131 (41)					
No	188 (59)					
9. Psychological consequences		-.02	.23	-.37	-.55	.00
Yes	214 (67)					
No	105 (33)					
10. Physical consequences		.00	.03	-.02	-.05	.00
Yes	39 (12)					
No	280 (88)					
11. Seizure frequency during the pandemic		-.95	-.97	-.35	-.05	.00
Free	172 (54)					
Twice a year	34 (11)					
Four or six times a year	30 (09)					
Twelve times a year or more	83 (26)					
12. Anxiety		.01	.17	.07	-.32	.00
Non-anxious	126 (39)					
Anxious	193 (61)					
13. Depression		.07	.40	-.57	-.65	.00
Non-depressed	138 (43)					
Depressed	181 (57)					
14. Sleep disorders		.03	.16	-.15	-.49	.00
Normal sleep	200 (63)					
Disordered sleep	119 (37)					
Eigenvalues			.95		.74	
Fit				1.68		
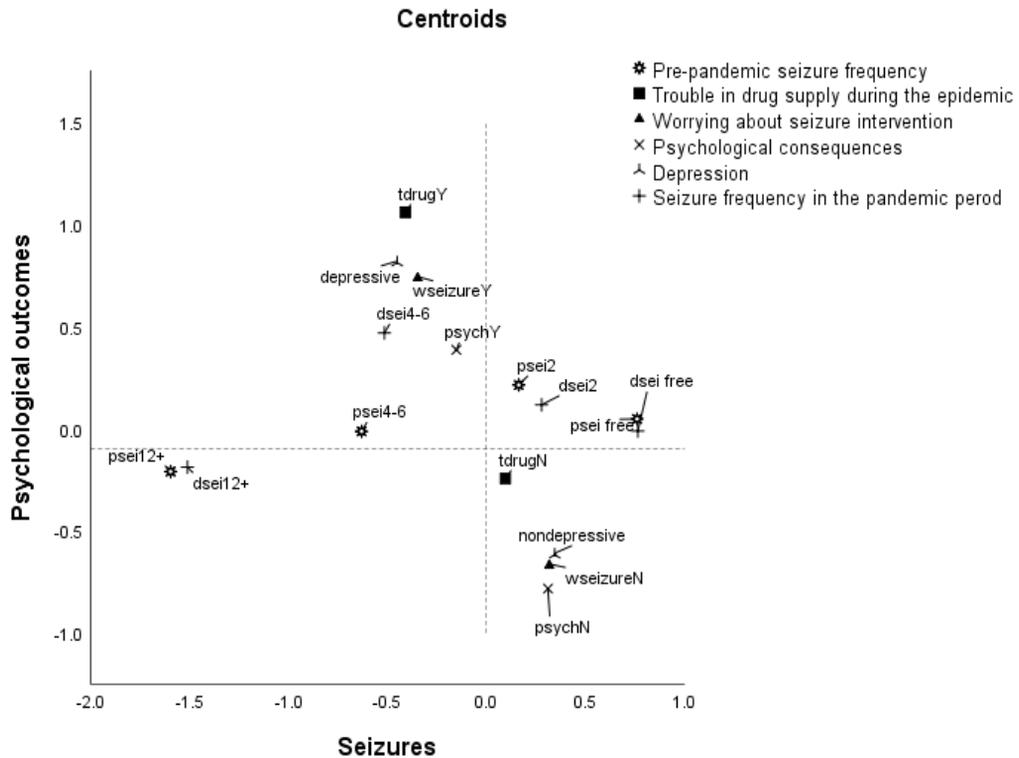
Figure 1. Centroid plot for seizures frequencies and psychological outcomes

Note: psei: pre-pandemic seizure frequency, dsei: seizure frequency during the pandemic, tdrugY: trouble in drug supply during the pandemic (yes), tdrugN: trouble in drug supply during the pandemic (no), wseizureY: worrying about seizure intervention (yes), wseizureN: worrying about seizure intervention (no), psychN: psychologically affected (no), psychY: psychologically affected (yes)

increased seizures, independent of the COVID-19 pandemic, already negatively affect patients` life in every sense.[23] When the effects of the COVID-19 pandemic are added to all these, epilepsy patients, especially those with poor seizure control, face more challenges.[24] Findings of this study confirm this situation and show that epilepsy patients feel the effects of the pandemic more, while those with ISC experience this situation more complicated. In addition, younger age and younger age-at-onset in the ISF group imply that the pandemic period is more difficult for patients with early-onset epilepsy. Although the literature reported that the COVID-19 pandemic threatens the health of the elderly more, it can be said that this situation is a little different for epilepsy patients because it is seen that the psychosocial life of epilepsy patients is more affected rather than their physical health. The increased frequency of seizures contributes to this situation and it is mostly seen in young individuals with early-onset epilepsy. Therefore, the impact of the pandemic on PwE, despite their young age, should not be underestimated.

Although epilepsy is not among the chronic diseases reported as a risk for severe COVID-19, studies conducted during the pandemic report that the fear and stress levels of PwE are quite high.[4,25] The main factors for this situation are the fear of experiencing an increase in seizure frequency, having to admit the hospital due to seizures, getting infected with the virus, and losing their lives due to the COVID-19. However, one study reported that only 5.3% of the PwE were infected with COVID-19, and only one of them had a slight worsening in seizures.[12] In many studies, rate of increase in seizure frequency has been reported between 5-30% during the pandemic, and this increase in seizures is caused by psychosocial problems, fear, anxiety, depression, and sleep problems as a result of the pandemic rather than the direct effect of COVID-19 [4,9,11,13,15,26-28]. From this point of view, it can be said that the pandemic affects psychosocial health rather than physical health in PWE and indirectly causes an increase in seizure frequency.[13] In addition, it was reported that patients who reported an increase

in seizure frequency during the pandemic also had frequent seizures before the pandemic, and patients in this group were more affected by the pandemic psychosocially.[9,26,29-30] Similarly, in our study, the seizure frequency before and after the pandemic was at close values, seizure-free periods of the patients were preserved, and there was a relative increase in those who had frequent seizures previously. In our study, the finding that the patients were most affected socially and psychologically, respectively, and the close positioning of this variable with frequent seizures on the graph emphasize the psychosocial trauma caused by the pandemic. In other words, it is possible that patients who cannot reach seizure control despite antiepileptics and who have a constant fear of seizures, feel the effects of the pandemic more deeply, and poor seizure control worsens with the psychosocial trauma caused by the pandemic. This is a bidirectional relationship between the psychosocial effects of the pandemic and the frequency of seizures. While psychosocial effects increase the frequency of seizures, in individuals with increased seizure frequency psychosocial impact would be worse.

In the COVID-19 pandemic, PWE were seriously affected like healthy individuals and they had to cope with problems such as reduction in social support due to home quarantine, disruption of daily life, sleep routine, and economic collapse.[31–33] In addition to these, the fear of not accessing antiepileptic drugs, the fear of having a seizure, and the anxiety of inability to respond to seizures were seen in PwE in our study. In addition, considering the biopsychosocial effects of epilepsy regardless of the pandemic, it can easily be said that patients remain vulnerable during the pandemic period and are in the group that needs support. In addition, it was observed that individuals experiencing all these problems were more psychologically affected by the pandemic. Therefore, providing telehealth services and maintaining medical and psychosocial care should be prioritized for PWE.[34-36] In this period, the patients must be supported by a healthcare professional, and they need to feel informed and safe. In particular, being anxious about responding to a seizure at home is an issue that needs to be addressed. From the moment of the diagnosis of epilepsy, counselling should be provided about seizure intervention, and especially nurses/epilepsy nurses should take more responsibility in this regard. A recently published study emphasized that epilepsy nurses had a significant role in reducing the negative effects of the pandemic.[14,37]

The absence of specialist nurses in Turkey can be considered a fundamental problem and making necessary improvements in this regard can be recommended.

Sleep quality and mental health are other important psychosocial outcomes in PwE during the pandemic. While the COVID-19 pandemic itself has the effect of disrupting mental health, it would easily worsen anxiety and depression, which are already high in these patients.[38-40] This study shows that the mental health and sleep quality of epilepsy patients are worse than healthy controls during the pandemic, especially in patients with ISF. Also, patients who stated that they were particularly psychologically affected were found to be depressive. Although anxiety and sleep problems have a notable impact, the depressive mood has the most important role in psychological effects. It is not surprising that PwE, who have additional problems due to their disease, are depressed, and their psychology is negatively affected in this pandemic when social support is decreased, the routine cycle of life is disrupted, sleep problems increase, and economic problems are experienced. With the biopsychosocial effect of epilepsy, it is of great importance to screen all patients for anxiety and depression, which are observed at high rates, and provide the necessary psychological counselling service. It would be more effective if these consultancy services, which will be provided to protect mental health, are not limited to the pandemic period and provided uninterruptedly.

In conclusion, in this study, it has been determined that the psychosocial effects of the COVID-19 pandemic create a significant burden for patients. However, it exerts its effect on the frequency of seizures indirectly, and this effect can be minimized with uninterrupted medical treatment, information, education, psychological counselling, and remote support services.

The limitation of this study is first, the fact that the frequency of seizures is based on patients` self-report instead of a more objective method such as an electronic seizure diary, and that some clinical data such as type of seizure could not be obtained can be considered as the limitation of the study. Patients' drug compliance and medication change may affect the frequency of seizures during the pandemic. The fact that this was not questioned in our study and therefore was not statistically controlled limits the results. It is recommended to evaluate such factors in future studies. It should also be considered that our data collection method may have affected the results

by causing the participants with a high level of education to be included in the study.

DISCLOSURE

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