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RESEARCH ARTICLE

A retrospective study of electroconvulsive therapy during COVID-19

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ABSTRACT

Objective: The Coronavirus Disease 2019 (COVID-19) pandemic has significantly impacted healthcare services, including the administration of electroconvulsive therapy (ECT) globally. This article investigates how operational and lockdown strategies at a single center in Turkiye affected patient characteristics undergoing ECT during the COVID-19 pandemic.

Method: Data on ECT patients was evaluated for 12 months, starting with the onset of COVID-19 restrictions, and compared with data on ECT patients from the corresponding 12-month period in the previous year.

Results: Between March 2020 and March 2021, there was a 65.0% decrease in ECT patients and a 67.5% reduction in ECT sessions compared to the previous year. Despite a statistically significant increase in the proportion of patients receiving ECT for emergency reasons in 2020 compared to 2019 (p=0.04), there was no change in the diagnostic profile of these patients (p=0.28). The mean number of ECT sessions, the response to ECT, and the clinical outcomes at discharge were comparable in both periods. However, the hospital stay for ECT patients was significantly longer (p<0.001).

Conclusion: The COVID-19 pandemic had a significant negative impact on ECT services. Data indicate that, even though ECT is considered an aerosol-generating procedure, the infection or disease transmission rate due to the procedure is low when appropriate precautions are taken. Therefore, ECT services should continue during future pandemics.

Keywords: COVID-19, coronavirus, electroconvulsive therapy, pandemic

INTRODUCTION

Electroconvulsive therapy (ECT), a standard treatment for specific conditions such as depression and other severe mental disorders with significant suicidality and catatonia or requiring rapid therapeutic intervention (1), was categorized as an 'aerosol-generating' procedure during the Coronavirus

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Disease 2019 (COVID-19) pandemic (2). The COVID-19 pandemic has had an unprecedented impact on healthcare services, including the administration of ECT globally. Traditionally viewed as an elective procedure, ECT, during the pandemic, was often classified as non-essential or non-urgent, causing considerable anxiety among providers and patients who rely on this treatment (3). Guidelines for ECT procedure, anesthesia, and administration were revised in response to concerns about the practice of ECT (4-6). Specialists in ECT have described changes and rationalizations in the triage and delivery of ECT necessary for providing the treatment safely and in compliance with infection control protocols (4,7-12).

The modern practice of ECT has never been so profoundly affected by a pandemic. The potential risk of cross-contamination within ECT departments, the risk to staff from aerosol-generating procedures during ECT, and the deployment of ECT teams have all contributed to restricting patient access to treatment (4,7-12). In April 2020, 53% of centers in the United Kingdom and Ireland administered ECT only in emergencies, and 24% closed. By July 2020, 78% of the centers reported insufficient capacity for providing ECT (13). In Canada, between mid-March and mid-May 2020, a decrease in ECT services was reported in 64% of centers, with a complete cessation of the practice in 27% (14). In the United States, 80% of ECT programs operated at less than 50% capacity in April and May 2020, with 95% deferring or delaying treatment for new ECT patients (15). A survey of 197 clinics in Germany, Austria, and Switzerland provided an overview of changes in ECT services during the acute phase of the COVID-19 pandemic; in these countries, more than a quarter of clinics temporarily suspended ECT treatments, and reductions in ECT application of up to 75% were reported in 28.2% of them (16).

On March 11, 2020, the Ministry of Health of the Republic of Turkiye announced the country's first confirmed COVID-19 case. From the announcement date of the first confirmed case, Turkiye implemented various social, political, economic, legal, military, religious, and cultural preventive measures to slow the epidemic's spread. All elective surgeries and patient examinations were postponed indefinitely, except for emergency surgeries. The government initially imposed a curfew on individuals aged 65 and over to reduce the epidemic's spread and promote social distancing. This restriction was later expanded to include children and young people aged 20 and under. As of June 1, 2020, during the "new normalization period," outpatient and inpatient clinic service principles were regulated in line with the World Health Organization and the Ministry of Health of Turkiye's Scientific Committee Guides. These regulations considered epidemiological data, epidemic rates, infrastructure facilities, and available human resources. On March 1, 2021, with the controlled normalization process, restrictions were implemented due to the increasing number of cases in many areas. These included the curfew application and categorizing each province into "low, medium, high, and very high" risk levels based on their risk status. Turkiye transitioned to the third stage of gradual normalization on July 1, 2021, lifting many restrictions that had been in place for 15 months (17,18).

ECT services at our center were halted on March 20, 2020, when elective procedures were postponed in Turkiye until June 1, 2020. The services resumed five days a week, with additional measures implemented for the COVID-19 pandemic. Our hospital serves the general populace of Istanbul and patients from different regions. Istanbul, the most populous city in the country with approximately 15 million residents, surpasses the population of many European countries. The catchment area's population is about 26 million. Annually, the number of psychiatric outpatients is around 315,000, while hospitalized patients number approximately 12,500. Istanbul has been the major center of the pandemic in Turkiye, recording the highest number of COVID-19 cases since the pandemic's onset due to its position as a crossroad between Europe and Asia and its status as an international hub. As of June 28, over half (54.8%) of the COVID-19 cases in Turkiye were reported in Istanbul (19).

There have been anecdotal reports, single-service studies, multisite national studies, and binational studies on the effects of the COVID-19 pandemic on ECT practice and service delivery at individual units (13-16,20). To date, minimal empirical data have demonstrated the impact of the early and delayed stages of the pandemic across different units (21,22). Therefore, understanding the effects of the COVID-19 pandemic on ECT delivery is crucial for informing planning for future pandemics with evidence-based practices.

The objective of this retrospective study was to evaluate the impact of the COVID-19 pandemic on the ECT center (a formal center of training in ECT applications in Turkiye) at the Bakirkoy Prof. Mazhar Osman Training and Research Hospital for Psychiatry,

Neurology, and Neurosurgery, Istanbul, Turkiye. It aimed to compare the profile of patients who received ECT during the first year of the pandemic (March 20, 2020 - March 19, 2021) with those from the previous year (March 20, 2019 - March 19, 2020).

METHODS

Study Design

Bakirkoy Prof. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery conducted this retrospective, single-center study. The ECT Center operates every workday, receiving referrals from the hospital's psychiatric units. Located on the first floor of one of the psychiatric wards, the center includes a waiting room, preparation room, application room, recovery room, and two post-recovery rooms. The staff comprises a psychiatrist-coordinator (head of the ECT unit), an anesthesiologist, two anesthesiology technicians, a supervising nurse, and two nurses. The patient's attending psychiatrists make decisions regarding diagnoses and ECT indications. Patients and their relatives/representatives are informed about ECT, and written informed consent is obtained. In emergencies, ECT is administered with written approval from two psychiatrists.

Ethical Approval

The study received approval from the University of Health Sciences Ethics Committee, Bakirkoy Dr. Sadi Konuk Training and Research Hospital Health Research (date: 06/12/2021, number: 2021-552). It was conducted in compliance with the ethical standards outlined in the 1964 Declaration of Helsinki and its subsequent revisions.

Operational Modifications to the ECT Procedure

ECT application at our institution complies with the American Psychiatric Association (23) and the Royal College of Psychiatrists (24) criteria. In response to the coronavirus pandemic beginning in 2020, additional tests and precautions were incorporated into our unit's planning and implementation procedures. These measures aimed to protect staff and patients and ensure the safe performance of ECT (25). Psychiatry clinics typically involve intense interpersonal contact in restricted environments with limited air circulation and high patient turnover. Consequently, the possibility of rapid contamination by any etiological agent was reevaluated, particularly affecting patients in the wards not receiving ECT.

Our center temporarily suspended ECT treatments following the initial COVID-19 risk assessment. After adapting examinations and practices to pandemic conditions to minimize contamination risks, we resumed applications with limited capacity. Although the protocol and patient evaluation strategy for safe ECT applications significantly reduced cross-infection risks, they notably decreased our treatment capacity.

Before the pandemic, ECT applications were conducted for 25 to 30 patients daily. However, this number was reduced to 6-8 per day under the limited protocol. Regular sessions were held between the microbiology and internal medicine departments and the ECT staff, focusing on the usage, adherence to protocols, and proper disposal of personal protective equipment. Polymerase Chain Reaction (PCR) tests were performed on all hospitalized patients, who were then taken to quarantine services. Patients with negative PCR test results were transferred to psychiatry services, while those with positive PCR test results were referred to a fully-equipped hospital with a COVID-19 inpatient service. Patients were clinically evaluated for signs or symptoms of COVID-19 infection. A PCR test was conducted before the first ECT treatment and repeated once a week during the ECT treatment period. The ECT unit was managed as a clean zone. Patients were admitted to the COVID-19 service if they tested positive while undergoing treatment. The administration of ECT to patients known or suspected of being COVID-19 positive was postponed until a negative test result was obtained.

ECT is administered in a facility comprising a waiting room, preparation room, ECT room, and recovery room/post-anesthesia care unit (PACU). Patients return to their respective wards from the PACU. The application and observation period was scheduled to last at least one hour. Measures were taken to prevent contact between patients from different services. On average, two patients per day were accommodated from the same service. The waiting area was limited to a maximum of two patients. The number of people in the treatment room was kept to a minimum, including the ECT nurse, psychiatrist, anesthesiologist, and anesthesia technician. Since the ECT room was considered contaminated, all personnel were required to wear complete personal protective equipment (PPE), including N95 masks, medical gowns, face shields, gloves, shoe covers, and bonnets. For ventilation, all windows in the ECT center were kept open. The

anesthesia team used a standard (manual) bag-valve mask for airway management. Given the PCR swab's false negative rate of up to 40% (26), every patient referred for ECT was treated as potentially infectious. During bag-mask ventilation, a disposable high-efficiency particulate air (HEPA) filter was placed between the bag and the mask (27). Ventilation was performed with attention to tight mask sealing and minimally effective tidal volumes and pressures. The mask remained in place through induction. There was no change in anesthesia induction agents or doses from the pre-pandemic period, with propofol used as the induction agent (typical dose 1 mg/kg).

After confirming loss of consciousness due to unresponsiveness to stimuli, succinylcholine (initial dose of 0.5 mg/kg) was administered for muscle relaxation. The mouth bite block was placed after muscle relaxation, confirmed by monitoring time and muscle fasciculation. Bitemporofrontal ECT was administered using a brief-pulse square-wave ECT device, Thymatron IV (Thymatron System IV device; Somatics, Inc, Lake Bluff, Ill). Continuous electrocardiogram and electroencephalogram monitoring were conducted, and breathing was maintained using positive pressure ventilation with 100% oxygen. A finger probe was applied to the patient whose spontaneous breathing was sufficient. Shortly after that, the patient could breathe adequately, opened his eyes in response to verbal instructions, and responded appropriately to verbal commands. After the procedure, patients were observed for 30 minutes, and fresh air flow was provided to the treatment room to reduce the risk of infection. During the COVID-19 pandemic, this procedure became routine at our center (25).

Data Collection

The data were collected from the ECT center and patients' medical records. We compared the data on ECT patients during the 12 months beginning with the first COVID-19 restrictions in 2020 (March 20, 2020 - March 19, 2021) to the data from the previous 12-month period (March 20, 2019 - March 19, 2020). A 12-month period was selected primarily to evaluate the acute and some delayed effects of the restrictions imposed during the COVID-19 pandemic and to obtain data comparable to that of studies conducted in other nations.

For inclusion in the study, individuals were required to have received ECT on the specified dates, and no patient files of those who underwent ECT at the center within these periods were excluded from the study. No exclusion criteria were applied other than those pertaining to the ECT procedure itself. One thousand four hundred forty-six patient files identified from the ECT data were reviewed, and relevant data was extracted. Repeated ECT sessions for the same patient were not counted in the total number of patients. Maintenance ECT is performed at this facility and was included in the data for the study. One hundred fifty-five maintenance ECT sessions were administered to nine patients during the 12 months before the pandemic, and no maintenance ECT was administered in the 12 months after the pandemic began.

We evaluated sociodemographic characteristics and clinical factors, including diagnosis, indication for ECT, previous responses to ECT, the total number of ECT sessions, the total number of days of hospital stay, and the mean number of ECT sessions. Additionally, the clinical response to ECT treatment and the Clinical Global Impression (Improvement) were assessed. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (28), patients were diagnosed.

The indications for ECT were categorized as either emergency or non-emergent. Emergency indications included suicidal risk and attempts, risk of homicide, excitement (risk of causing harm to oneself and others), catatonic stages, and refusal to eat or drink, resulting in malnutrition. Non-emergent indications included failure of pharmacotherapy (failure to treat with medications), a prior positive response to ECT, patient preference, and medication intolerance. Improvements were evaluated using the Clinical Global Impressions-Improvement (CGI-I) scale (29). According to the discharge summary, medical chart, and computerized data, the clinical responses at discharge were categorized as "total improvement," "partial improvement," and "non-responsiveness."

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) for Windows version 22.0 program was utilized for statistical analysis. The Kolmogorov-Smirnov test was used to determine the normality of the data distribution. Continuous data were compared using the Student's t-test for parametric distributions and the Mann-Whitney U test for nonparametric distributions. The Pearson chi-square test was used for qualitative data. The threshold for statistical significance was set at $p<0.05$.

Table 1: Comparison of sociodemographic data of patients who underwent ECT

Variables	Pre-COVID-19 period (n=1.078)		COVID-19 period (n=368)		p
	n	%	n	%	
Age, years (Mean±SD)	36.92±11.81		34.67±11.77		[a]**0.002**
Number of patients					[b]**0.041**
<18	11	1.0	8	2.2	
18-65	1.047	97.1	353	95.9	
>65	20	1.9	7	1.9	
Sex					[b]0.952
Male	601	55.8	206	56.0	
Female	477	44.2	162	44.0	
Marital status					[b]0.602
Single	391	36.3	110	29.9	
Married	291	27	87	23.6	
Divorced/widow	133	12.3	49	13.3	
Education					[b]0.063
≤8 years	636	59	197	53.5	
>8 years	442	41	171	46.5	

SD: Standard deviation; n: Number of cases; %: Percentage of the group; a: Student's t-test; b: Pearson Chi-square test; Bold items indicate statistically significant differences at the 0.05 level.

RESULTS

A total of 1,446 patients, consisting of 1,078 patients before the COVID-19 pandemic and 368 patients during the COVID-19 pandemic, were evaluated retrospectively. Table 1 summarizes the demographic characteristics of the patients. The gender distribution was comparable (p=0.952), but there was a significant difference in age between the two groups (p=0.001) (Table 1). The number of patients undergoing ECT decreased by 65% from March 2020 to March 2021, from 1,078 to 368. During the COVID-19 pandemic, the total number of ECT sessions decreased by 13.9% (from 101 to 87) for adolescent patients, 68.03% (from 7,711 to 2,556) for adult patients, 71.9% (from 82 to 23) for elderly patients, and 67.5% (from 7,894 to 2,556) for the entire group.

The clinical variables of ECT patients and descriptive statistics for ECT treatment characteristics are presented in Table 2. During the COVID-19 pandemic, a smaller proportion of patients had a history of tobacco (p=0.002), alcohol (p=0.01), or substance use (p<0.001). In contrast, more ECT patients had more than one comorbid physical illness (p=0.02).

There was no significant difference in the mean number of ECT sessions (p=0.09) between the two time periods for the entire group. However, the mean number of ECT sessions for adult patients was significantly lower during the pandemic (p=0.03) (Table 2).

Patients' diagnoses were classified into three groups:

- Psychotic disorders (schizophrenia, substance-induced psychosis, atypical psychosis, delusional disorder)
- Manic episodes (schizoaffective mania, bipolar mania)
- Depression (bipolar depression, unipolar depression, schizoaffective depression).

The diagnostic profile of ECT patients did not differ significantly between the two time periods (p=0.816). Psychotic disorders were the most prevalent diagnostic category in both periods (55.6% and 54.1%, respectively), followed by manic episodes (27.4% and 29.1%) and depression (17.1% and 16.1%, respectively) (Table 2).

Failure of pharmacotherapy was the primary indication for ECT during the pandemic, as it was in the pre-pandemic period (66.7% and 62%), followed by suicidal and homicidal tendencies (27.1% and 32.3%), with no significant difference (p=0.09). The proportion of patients receiving ECT for an urgent indication significantly increased from 33% in 2019 to 39.6% in 2020 (p=0.04) (Table 2).

Table 2: Comparison of clinical variables of patients who underwent ECT

Variables	Pre-COVID-19 period (n=1.078)		COVID-19 period (n=368)		p
	n	%	n	%	
Total number of ECT sessions	7.894		2.566		
Mean number of ECT sessions (Mean±SD)	7.36±2.86		7.03±3.94		[a]0.091
<18	9.90±7.82		10.87±2.53		[a]0.184
18-65	7.35±2.76		6.95±2.42		[a]**0.033**
>65	5.80±2.04		6.71±3.94		[a]0.340
Body Mass Index (Mean±SD)	26.76±6.03		25.93±6.05		[a]**0.007**
ASA					[b]0.617
I	263	24.8	110	29.9	
II	766	71.1	245	66.6	
III	48	4.5	13	3.5	
IV	1	0.1	0	0	
Smoking	749	69.5	224	60.9	[b]**0.002**
Alcohol	141	13.1	70	11.9	[b]**0.012**
Substance	286	31.1	47	16.8	[b]<**0.001**
Drug Allergy	32	3.0	11	3.0	[b]0.984
Presence of comorbid systemic disease	85	7.9	48	13	[b]**0.021**
Presence of previous ECT	341	31.6	122	33.2	[b]0.590
Diagnosis					[b]0.816
Psychotic disorders	599	55.6	199	54.1	
Manic episodes	295	27.4	107	29.1	
Depression	184	17.1	62	16.8	
ECT indication					[b]**0.044**
Urgent	348	32.3	140	38.0	
Non-urgent	730	67.7	228	62.0	
ECT indication					[b]0.091
Failure of pharmacotherapy	719	66.7	228	62.0	
Failure of pharmacotherapy+suicide/homicide/excitation	292	27.1	119	32.3	
Failure of pharmacotherapy+catatonia	21	1.9	7	1.9	
Inadequate oral intake	34	3.2	14	3.0	
Previous good response to ECT	12	1.1	0	0	
Clinical outcome at discharge					[b]0.255
Partly Improved	504	46.8	165	44.8	
Improved	544	50.5	188	51.1	
Other*	30	2.8	11	4.1	
Clinical response to ECT treatment with CGI-I					[b]0.189
Non-responsive	51	4.7	25	6.8	
Partly improved	415	38.5	155	42.1	
Improved	547	50.7	169	45.9	
Other**	65	6.0	19	5.26	
Total number of days of hospital stay	29.33±13.82		36.98±15.05		[a]<**0.001**
Total number of days from admission to ECT onset	9.65±8.27		15.19±10.21		[a]<**0.001**
Total number of days from the last ECT session to discharge	6.05±8.12		7.24±6.95		[a]**0.013**

SD: Standard Deviation; n: Number of cases; %: Percentage of the group; a: Mann-Whitney U test; b: Pearson Chi-square test. Bold items indicate statistically significant differences at the 0.05 level. Psychotic Disorder: Includes schizophrenia, substance-induced psychosis, atypical psychosis, and delusional disorder. Manic Episodes: Includes schizoaffective mania and bipolar mania. Depression: Includes bipolar depression, unipolar depression, and schizoaffective depression. Urgent: Defined as cases with suicide risk, catatonia, aggression/agitation, and inadequate oral intake. Non-urgent: Includes failure of pharmacotherapy, previous good response to ECT, patient preference, and poor tolerability/risks associated with medications. *: Other: Includes discharge at family request, terminating treatment due to side effects, terminating treatment due to unresponsiveness, referral, and referral due to COVID-19. **: Other: Includes discharged at family request, discharged at own request, referral, referral due to COVID-19, and continued treatment for a prolonged period.

During the pandemic, the response rate to ECT treatment was 95.9%, and the global clinical response rate was 88%, while 6.8% of patients were discharged with no discernible change in clinical features. In both periods, the response to ECT treatment and clinical outcomes at discharge were comparable ($p>0.05$); however, the length of hospital stay for ECT patients was significantly longer ($p<0.001$). During the pandemic, the total number of days from admission to ECT onset and the total number of days from the last ECT session to discharge significantly increased ($p<0.05$) (Table 2).

DISCUSSION

This study is the first in Turkiye to examine demographic, clinical, and practice data changes for patients who underwent ECT at a training ECT center during the first year of the COVID-19 pandemic. The most significant finding of this study is that the COVID-19 pandemic led to a nearly 70% reduction in the number of ECT sessions.

This decline in our ECT services during the pandemic can be attributed to multiple factors. ECT, often considered an 'elective technique,' was initially temporarily discontinued. ECT operations require direct clinician-patient contact, and the pandemic-induced necessity for personal protective equipment (PPE) resulted in additional time constraints. According to algorithmic protocols, ECT treatment rooms had to be cleaned and ventilated between patient sessions. Pre-treatment COVID-19 tests and additional examinations and consultations also consumed time. ECT applications were prioritized for patients requiring urgent treatment, while those in less urgent situations were deprioritized. ECT intervals were extended, and the most severely ill patients were prioritized.

A survey among members of the Indian Psychiatric Society, similar to our study, showed a two-thirds reduction in the initiation of new ECT treatments between March 2020 and March 2021 (21). Another study comparing 12 months of ECT data in Japan during the COVID-19 pandemic reported that ECT procedures were less interrupted there, unlike in other countries. The researchers attributed this lower impact of the epidemic on ECT practices in Japan to the relatively small number of infected individuals and the absence of movement restrictions, such as curfews (22).

Although the data presented here was obtained from the largest psychiatric hospital in Turkiye, it may not represent the entire population. ECT practices and utilization rates vary among countries and even within regions of the same country (30,31). According to studies conducted at different times in other countries, utilization rates were reported as follows: 14.3% in India (32), 27.7-62.5% in Nigeria (33), 29.22% in Pakistan (34), 3% in Austria (35), 5% in Sweden, Norway, and Denmark (36,37), 0.79% in Poland, (31), 1-9% in Pacific countries (31), 6-12% in university hospitals in the USA (38), and 0.4-1.6% in public hospitals (39). Some Eastern countries report low ECT rates. For instance, studies from Hong Kong show the ratio of patients receiving ECT treatment to be 0.27 to 0.34 per 10,000 persons (30). In contrast, ECT is less frequently used in Western countries, with rates of 0.31/10,000 of the general population in Hungary, 3.785/10,000 in Australia, 0.08/10,000 in Germany, and 4.7/10,000 in Belgium (31,40-42).

Since data on ECT are not collected in a single center in Turkiye, the information on what percentage of all ECT procedures in Turkiye are performed by our institute was not presented in this article. However, a retrospective study conducted at our hospital between 2008 and 2010 reported that out of 24,310 psychiatric patients hospitalized due to acute illness, 14.34% received ECT (43). Similar studies conducted in Turkiye report ECT application rates in inpatients between 2.2% and 16.3% (44,45). These results are higher than the rates in the United States, European countries, and some Asia-Pacific countries (44).

Another important finding of our study was the lack of significant differences in the diagnostic profile and distribution of patients who underwent ECT during the pandemic. However, the rate of patients undergoing ECT with an emergency indication increased. In both periods, psychotic disorders, including schizophrenia and atypical psychosis, had the highest number of patients, followed by those with manic episodes and depression, respectively. A previous study conducted at this center also identified affective and psychotic disorders as the leading diagnoses for ECT (43). In another study conducted in Turkiye, ECT was reported to be most commonly performed on patients with bipolar disorder in manic phases and on patients with schizophrenia (44). The distribution of diagnoses among patients treated with ECT at our center was similar to that in Asian countries. However, it differed from Europe (31), where affective and psychotic disorders are more prominent than depression, the most common indication for ECT in the West (43). Specific characteristics of our

center may have contributed to this difference. Most patients hospitalized here present complex cases where numerous psychopharmacological treatments have been tried without adequate response. ECT is considered a last resort when all other treatment options have been unsuccessful, which may lead to its use for a broader range of diagnoses. The belief that the response to ECT is faster than pharmacotherapy may also play a role in some acute, severe cases (40,46).

Kwan et al. (20) reported an increase in patients undergoing ECT with emergency indications during the pandemic. Similarly, Surve et al. (5) noted that the number of patients decreased in the first months of the pandemic and was limited only to emergency cases, such as catatonia, suicidal ideation, or homicidal behavior. Our study also determined the rate of patients who underwent ECT for emergency indications, such as suicide risk, catatonia, aggression/agitation, and inadequate oral intake. We concur with Kwan et al. (20) that the increased use of ECT during the pandemic, particularly for urgent cases, is attributable to the limited ECT resources being prioritized for those with more severe diseases. The fact that the rate of our patients with comorbid systemic diseases is higher than before the pandemic aligns with Grover et al. (21) study findings. People at greater risk from COVID-19 include older adults, smokers, and those with underlying comorbidities such as cardiovascular and cerebrovascular disease, hypertension, diabetes mellitus, chronic obstructive pulmonary disease, malignancy, and chronic kidney disease (47). Therefore, the observed increase in patients with comorbid physical diseases like hypothyroidism, hypertension, diabetes, hepatitis, and heart disorders may be attributed to prioritizing these patients for ECT. Evaluating this alongside the patients' stable diagnostic profile suggests that the systemic diseases of the patients may have necessitated urgent ECT applications.

In comparing the first six months of pandemic data with pre-pandemic data at an ECT center in Australia, Jagadheesan et al. (48) reported that the number of ECTs decreased by 69.1% among older patients but increased by 18.4% among adult patients, resulting in an overall decrease of 23.9%. The authors suggested that the increase in adult patients could have been due to incidental factors or a clinical deterioration during the lockdown period, leading to increased ECT needs. In this study, the distribution of patients into age groups remained similar in both periods. The two groups did not differ in the mean number of ECT sessions. However, there was a significant decrease in the mean number of ECTs for adult patients during the pandemic compared to before. Notably, there was an increase in the number of adolescent patients compared to the pre-pandemic period, while the number of patients over the age of 65 remained unchanged. In both sample periods, adult patients were the most frequent recipients of ECT sessions. The decrease in applications among this group may have contributed to the reduction in the average number of ECT sessions.

Despite the challenges of the pandemic process and the procedural measures required for ECT treatment, the average number of sessions per person and the outcomes of ECT treatment, including psychiatric service discharge between the two periods, can be viewed positively. However, in this study, patients who received ECT during the COVID-19 pandemic experienced more prolonged hospitalizations, as stated by the Royal College of Psychiatrists (49). This extended duration of hospital stays has been attributed to the reduced accessibility of ECT services during the pandemic, resulting in patients being more unwell or having longer hospitalizations (49). The increase in the average length of stay can be linked to the decrease in daily ECT appointments. Additionally, there was reluctance to proceed with non-emergency ECT during the pandemic, even when indicated, leading to disruptions for several patients who were in the middle of ECT courses at the onset of the pandemic (10).

The practices implemented were intended to protect patients from potential exposure to asymptomatic medical staff or vice versa. Initially, there was apprehension among ECT staff due to stringent safety procedures, but regular communication helped ease any concerns. Notably, no individuals on the ECT team developed symptoms of COVID-19 infection or had positive PCR tests during the year. Among the 368 patients who underwent ECT, 16 (4.34%) tested positive for COVID-19. Four of these patients were referred to the pandemic hospital. For the remaining 12 patients, ECT treatment continued after their PCR test returned negative during their follow-up in our hospital's quarantine service. Despite repeated testing for COVID-19 infection, only four out of 90 patients (4.44%) tested positive for COVID-19 over one year, as reported by Grover et al. (21). Bryson et al. (8) stated that 53 ECT treatments were administered to eight patients during the first month of the pandemic. One in eight patients (12.5%) ultimately

developed COVID-19 infection during his acute course. Although the number of ECTs decreased, we were able to perform daily ECT applications without any contamination or mortality during the pandemic compared to before the pandemic by adhering to precautions and complying with the established algorithms. The rigorous preventive measures, such as Personal Protective Equipment (PPE) and weekly PCR tests for patients, resulted in zero positive cases among the medical staff.

This study has limitations inherent to retrospective studies. It covered only a single tertiary psychiatric hospital, the largest regional psychiatric hospital in Turkiye, and the facility was relatively experienced in ECT practice, which could limit the generalizability of the results. Including patients from different units affiliated with a single center means the frequency of ECT may differ from that at other mental health centers. The findings need to be supported by further research conducted in different centers providing mental health services. Additionally, the data presented here does not include information from patients who required ECT but were not included in the study. The study also did not include findings regarding the course of severe psychiatric disorders after the discontinuation of ECT.

CONCLUSION

This study is unique in its analysis of the first year of the COVID-19 pandemic in Turkiye and its description of procedures for the safe application of ECT. The findings demonstrate that, despite decreasing numbers, similar operations can still be performed in daily ECT practice without contamination or mortality during the pandemic, compared to the pre-pandemic period. This situation can be achievable by taking precautions and following established algorithms. The rigorous preventive measures implemented, such as using Personal Protective Equipment (PPE) and weekly PCR tests for patients, resulted in zero positive COVID-19 cases among the medical staff. Pandemics remain ongoing threats that can develop rapidly, necessitating that mental health services have access to data that helps them respond to crises promptly. Future studies should focus on strategies to mitigate the risks associated with the evolving trajectory of future pandemics. Safe application practices can be achieved by reaching a systematic consensus with input from multiple treatment centers' professionals.

Contribution Categories		Author Initials
Category 1	Concept/Design	C.O., O.A., D.I., Z.E.K.
	Data acquisition	C.O., O.A., D.I., Z.E.K., Z.D.G., H.B., O.O., O.E.C.
	Data analysis/Interpretation	C.O., O.A., Z.D.G., H.B., O.O., O.E.C.
Category 2	Drafting manuscript	C.O., O.A., D.I., Z.E.K., Z.D.G., H.B., O.O., O.E.C.
	Critical revision of manuscript	C.O., O.A., D.I., Z.E.K., Z.D.G., H.B., O.O., O.E.C.
Category 3	Final approval and accountability	C.O., O.A., D.I., Z.E.K., Z.D.G., H.B., O.O., O.E.C.

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REFERENCES

1. Kellner CH, Obbels J, Sienaert P. When to consider electroconvulsive therapy (ECT). Acta Psychiatr Scand 2020; 141: 304-315. [CrossRef]
2. Purushothaman S, Fung D, Reinders J, Garrett-Walcott S, Buda M, Moudgil V, et al. Electroconvulsive therapy, personal protective equipment and aerosol generating procedures: A review to guide practice during coronavirus disease 2019 (COVID-19) pandemic. Australas Psychiatry 2020; 28:632-635. [CrossRef]
3. Chopra V, Toner E, Waldhorn R, Washer L. How should U.S. hospitals prepare for coronavirus disease 2019 (COVID-19)? Ann Intern Med 2020; 172:621-622. [CrossRef]
4. Espinoza RT, Kellner CH, McCall WV. Electroconvulsive therapy during COVID-19: An essential medical procedure-maintaining service viability and accessibility. J ECT 2020; 36:78-79. [CrossRef]
5. Surve RM, Sinha P, Baliga SP, M R, Karan N, JI A, et al. Electroconvulsive therapy services during COVID-19 pandemic. Asian J Psychiatr 2021; 59:102653. [CrossRef]
6. Sarma S, Branjerdporn G, McCosker L, Kenwothy S, Ryan L, Dong V, et al. Strategies from a multi-national sample of Electroconvulsive Therapy (ECT) services: Managing anesthesia for ECT during the COVID-19 pandemic. Psychiatr Int 2022; 3:320-331. [CrossRef]
7. Boland X, Dratcu L. Electroconvulsive therapy and COVID-19 in acute inpatient psychiatry: More than clinical issues alone. J ECT 2020; 36:223-224. [CrossRef]
8. Bryson E, Aloysi A. A strategy for management of ECT patients during the COVID-19 pandemic. J ECT 2020; 36:149-151.

9. Demas ML. Electroconvulsive therapy and triaging during reduced access and the COVID-19 pandemic: A personal perspective. J ECT 2020; 36:226-228. [CrossRef]
10. Gil-Badenes J, Valero R, Valentí M, Macau E, Bertran MJ, Claver G, et al. Electroconvulsive therapy protocol adaptation during the COVID-19 pandemic. J Affect Disord 2020; 276:241-248.
11. Ramakrishnan V, Kim Y, Yung W, Mayur P. ECT in the time of the COVID-19 pandemic. Australas Psychiatry 2020; 28:527-529.
12. Tor PC, Tan J, Loo C. Model for ethical triaging of electroconvulsive therapy patients during the COVID-19 pandemic. BJPsych Bull 2021; 45:175-178. [CrossRef]
13. Braithwaite R, Chaplin R, Sivasanker V. Effects of the COVID-19 pandemic on provision of electroconvulsive therapy. BJPsych Bull 2022; 46:137-140. [CrossRef]
14. Demchenko I, Blumberger D, Flint AJ, Anderson M, Daskalakis ZJ, Foley K, et al. Electroconvulsive therapy in Canada during the first wave of COVID- 19: Results of the "What Happened" national survey. J ECT 2022; 38:52-59. [CrossRef]
15. Maixner DF, Weiner R, Reti IM, Hermida A, Husain HM, Larsen D, et al. Electroconvulsive therapy is an essential procedure. Am J Psychiatry 2021; 178:381-382. [CrossRef]
16. Karl S, Schönfeldt-Lecuona C, Sartorius A, Grözinger M. Provision of electroconvulsive therapy during the COVID-19 pandemic. A survey among clinics in Germany, Austria, and Switzerland. J ECT 2022; 38:205-210. [CrossRef]
17. T.C. Saglik Bakanligi COVID-19 Bilgilendirme Platformu. https://covid19bilgi.saglik.gov.tr/depo/rehberler/COVID 19_ Rehberi.pdf. Accessed Jun 1, 2020.
18. General Coronavirus Table. https://covid19.saglik.gov.tr/TR-66935/general-corona virus-table.html. Accessed Apr 3, 2023.
19. COVID-19 Situation Report. https://dosyamerkez.saglik.gov.tr/Eklenti/37743,covid-19-situa tion-report v4pdf.pdf?0. Accessed Jul 2, 2020.
20. Kwan E, Le B, Loo CK, Dong V, Tor PC, Davidson D, et al. The impact of COVID-19 on electroconvulsive therapy: A multisite, retrospective study from the clinical alliance and research in electroconvulsive therapy and related treatments network. J ECT 2022; 38:45-51. [CrossRef]
21. Grover S, Sinha P, Sahoo S, Arumugham S, Baliga S, Chakrabarti S, et al. Electroconvulsive therapy during the COVID-19 pandemic. Indian J Psychiatry 2021; 62:582-584. [CrossRef]
22. Hirata R, Kawashima H, Tsuboi T, Wada K, Takebayashi M, Suwa T. An online survey about electroconvulsive therapy in japan during the COVID-19 pandemic: Comparison of early and recent stages. Neuropsychiatr Dis Treat 2022; 18:1277-1285. [CrossRef]
23. Jaffe R. The Practice of Electroconvulsive Therapy: Recommendations for Treatment, Training and Privileging: A Task Force Report of the American Psychiatric Association. Second ed., Washington, DC: American Psychiatric Publishing, 2001.
24. Scott AIF. The ECT Handbook: The Third Report of the Royal College of Psychiatrists' Special Committee on ECT. London: Royal College of Psychiatrists, 2005.
25. Atay O. Elektrokonvülsif tedavi: Uygulama ve etkinlik. In: Atagun MI, Atay O. Psikiyatride Biyolojik Tedaviler: Nöromodülasyon. Ankara: Turkiye Psikiyatri Dernegi, 2022, 49-67. [Turkish]
26. Weissleder R, Lee H, Ko J, Pittet MJ. COVID-19 diagnostics in context. Sci Transl Med 2020; 12:eabc1931. [CrossRef]
27. Lapid MI, Seiner S, Heintz H, Hermida AP, Nykamp L, Sanghani SN, et al. Electroconvulsive therapy practice changes in older individuals due to COVID-19: Expert consensus statement. Am J Geriatr Psychiatry 2020; 28:1133-1145. [CrossRef]
28. First M, Ward M, editors. Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Fifth ed., Washington, DC: American Psychiatric Publishing, 2013, 783-808.
29. Guy W. ECDEU Assessment Manual for Psychopharmacology, Revised. Rockville, MD: US Department of Health, Education, and Welfare. Public Health Service Alcohol, Drug Abuse, and Mental Health Administration, 1976.
30. Chung KF. Electroconvulsive therapy in Hong Kong: Rates of use, indications, and outcome. J ECT 2003; 19:98-102. [CrossRef]
31. Gazdag G, Palinska D, Kloszewska I, Sobow T. Electroconvulsive therapy practice in Poland. J ECT 2009; 25:34-38. [CrossRef]
32. Shukla GD. Electro-convulsive therapy : a review. Indian J Psychiatry 1989; 31:97-115. [CrossRef]
33. Odejide AO, Ohaeri JU, Ikuesan BA. Electroconvulsive therapy in Nigeria. Convuls Ther 1987; 3:31-39.
34. Minhas HM, Ostroff R. Practice of electroconvulsive therapy in a tertiary care hospital in Pakistan. J ECT 2012; 28:7-9. [CrossRef]
35. Tauscher J, Neumeister A, Fischer P, Frey R, Kasper S. Electroconvulsive therapy in clinical practice. Nervenartz 1997; 65:410-416. [German] [CrossRef]
36. Andersson JE, Bolwig TG. Electroconvulsive therapy in Denmark 1999. A nation-wide questionnaire study. Ugeskr Laeger 2002; 164:3449-3452. [Danish]
37. Schweder LJ, Lydersen S, Wahlund B, Bergsholm P, Linaker OM. Electroconvulsive therapy in Norway: Rates of use, clinical characteristics, diagnoses, and attitude. J ECT 2011; 27:292-295.
38. Fink M. Convulsive therapy: A review a of first 55 years. J Affect Disord 2001; 63:1-15. [CrossRef]
39. Sylvester AP, Mulsant BH, Chengappa KN, Sandman AR, Haskett RF. Use of electroconvulsive therapy in a state hospital: A 10-years review. J Clin Psychiatry 2000; 61:534-539. [CrossRef]
40. Chanpattana W. A questionnaire survey of ECT practice in Australia. J ECT 2007; 23:89-92. [CrossRef]
41. Lauter H, Sauer H. Electroconvulsive therapy: A German perspective. Convuls Ther 1987; 3:204-209.
42. Sienaert P, Bouckaert F, Milo W, Peuskens J. Electroconvulsive therapy in Belgium: A questionnaire study on the practice of electroconvulsive therapy in Flanders and the Brussels Capital region. J ECT 2005; 21:3-6. Erratum in: J ECT 2015; 31:75.
43. Canbek O, Menges OO, Atagun MI, Kutlar MT, Kurt E. Report on 3 years' experience in electroconvulsive therapy in Bakirkoy Research And Training Hospital for Psychiatric and Neurological Diseases: 2008-2010. J ECT 2013; 29:51-57. [CrossRef]

44. Saatcioglu O, Tomruk NB. Practice of electroconvulsive therapy at the research and training hospital in Turkey. Soc Psychiatry Psychiatr Epidemiol 2008; 43:673-677. [CrossRef]

45. Zengin-Eroglu M, Kiraz S, Yasar AB, Dogan T. ECT practices in a psychiatry clinic at a training and research hospital. Dusunen Adam 2017; 30:325-330. [CrossRef]

46. Chanpattana W. One hundred twenty years of mental health care in Thailand and the development of electroconvulsive therapy. J ECT 2010; 26:11-13. [CrossRef]

47. Emami A, Javanmardi F, Pirbonyeh N, Akbari A. Prevalence of underlying diseases in hospitalized patients with COVID-19: A systematic review and meta-analysis. Arch Acad Emerg Med 2020; 8:e35. [CrossRef]

48. Jagadheesan K, Walker F, Danivas V, Itrat Q, Lakra V. COVID-19 and ECT-A Victorian perspective. Australas Psychiatry 2021; 29:540-545. [CrossRef]

49. Royal College of Psychiatrists. Two thirds of patients can't get life-saving ECT treatment for mental illness during the pandemic. https://www.rcpsych.ac.uk/news-and-features/latest-news/detail/2020/07/15/two-thirds-of-patients-cant-get-life-saving-ect-treatment-for-mental-illness-during-the-pandemic. Accessed Dec 14, 2023.