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The Effect of the COVID-19 Pandemic on Functioning of Neurosurgery Clinics and the Anxiety Levels of Neurosurgeons in Turkey

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ABSTRACT

AIM: To reveal the impacts of the novel coronavirus 2019 (COVID-19) pandemic on the functioning of neurosurgery clinics and to determine the anxiety levels and attitudes of Turkish neurosurgeons towards their profession during the pandemic.

MATERIAL and METHODS: The Beck anxiety inventory and a clinical activities scale were utilized as data collection tools and distributed to neurosurgeons in Turkey as an online survey. Descriptive statistical methods, significance tests and correlation and regression analyses were employed to analyze the data. The data analysis was carried out in a 95% confidence interval.

RESULTS: Of the 240 neurosurgeons who participated in the study, 63.8% had encountered cases of COVID-19 and 53.8% had handled patients diagnosed with COVID-19. The study results showed that the pandemic did not cause anxiety in 62.9% of the respondents, but it caused mild anxiety in 13.8% and moderate anxiety in 12.12%. The findings also revealed a low linear correlation between the anxiety values and occupational anxiety of the neurosurgeons and low inverse correlation between anxiety values and the protection factor in the pandemic period.

CONCLUSION: The COVID-19 pandemic has caused serious disruptions in the routine functioning of neurosurgery clinics and changes in the attitudes of neurosurgeons. Healthcare organizations should take the necessary precautions and measures to resolve the anxiety problems of healthcare professionals, such as providing professional support, and ensure that they can work in a safer environment.

KEYWORDS: Anxiety level, Beck anxiety inventory, COVID-19, Neurosurgeon, Neurosurgery clinic

ABBREVIATIONS: ANOVA: Analysis of Variance, **COVID-19:** Coronavirus Disease 2019, **CT:** Computed Tomography, **WHO:** World Health Organization, **KMO:** Kaiser-Meyer-Olkin, **MERS:** Middle East respiratory syndrome, **PPE:** Personal Protective Equipment, **SARS-CoV-2:** Serious Acute Respiratory Syndrome-Coronavirus-2, **SARS:** Serious Acute Respiratory Syndrome, **SPSS:** Statistical Package for Social Sciences

INTRODUCTION

Pandemics have permanent effects that leave important marks on societies. Beyond the disease itself or the deaths it causes, a pandemic can have many psychological, social, and economic consequences. The new coronavirus 2019 (COVID-19) emerged in China for the first time in the world in December 2019 and spread all over the world. The virus is thought to be effective enough to change the course of history. Turkey is also affected by the virus as well as all over the world.The Republic of Turkey Ministry of Health has announced the first case on March 11, 2019 in Turkey. It spread rapidly throughout the country afterwards (3).

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The COVID-19 that is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been declared as a pandemic by the World Health Organization (WHO) on March 11, 2020 (23). On April 26, 2020, when the survey has conducted, 2,131 cases have been detected in Turkey, and 95 fatalities have been recorded. The prevalence of COVID-19 was 1.32‰ and the daily incidence was 2,357 April 26, 2020. Recently, on June 18, 2020, totally 184,031 cases have been detected, and 4882 fatalities have been recorded in Turkey. The prevalence of COVID-19 was 2.21‰ and the daily incidence was 1,304 as of June 18, 2020 (6). The symptoms of COVID-19 infection are dry cough, fever, tiredness, shortness of breath, myalgia, and sore throat (11). Human to human transmission of COVID-19 has been shown occur via droplets, close contact, and virus-bearing fomites (14). Healthcare professionals have been affected part of the community since they work in highly infectious environments, and so, the medical attitudes and treatment priorities of healthcare professionals have been negatively affected.

Authorities in countries where the virus has been detected have taken various measures to minimize the impact of the pandemic. In Turkey, the public was advised not to go to a hospital unless it was an emergency, and strict measures have been and continue to be implemented, such as curfews for individuals over 65 and under 20 years old; travel restrictions to metropolitan cities; a general curfew on weekends; and closures of schools, restaurants, cafes and hairdressers. Polyclinics, patient services, and operating rooms have been redesigned to suit the pandemic situation and reorganized to serve COVID-19 patients separately (5,12).

Concerns about the risk of transmission during interventional procedures, such as outpatient services and emergent and elective surgeries, have likely affected clinical functioning and the attitudes and behaviors of neurosurgeons, which may, in turn, cause them to feel anxiety. Therefore, the present study was carried out during the COVID-19 pandemic to record changes in the clinical attitudes of neurosurgeons, the routine clinical functioning process, and the post-operative follow-up process, as well as to understand the anxiety levels of neurosurgeons.

MATERIAL and METHODS

This study is a descriptive study, and quantitative data was collected using the survey method.

Population and Sampling

The population of this study consisted of neurosurgery residents, neurosurgery specialists, and academic neurosurgeons in Turkey. Under the current conditions, data collection can only be done virtually with the help of online tools. Consequently, the data was collected utilizing a clinical activity scale and the Beck Anxiety Inventory, which were created online. The survey was e-mailed to all 1,700 neurosurgeons in Turkey with the support of the Turkish Neurosurgical Society. Announcements were made through social media networks, and personal communications were sent to encourage participation in the survey. The overall distribution of the population was similar to the distribution of neurosurgeons in Turkey.

The data collection period started on April 24, 2020 and ended on April 26, 2020. In total, 240 valid surveys were obtained. Since the researchers were not able to identify the participants, the appropriate sampling method was used for data collection. The aforementioned number of respondents corresponds to approximately 15% of the 1,700 neurosurgeons actively working in Turkey. Given the pandemic conditions and physicians' unwillingness to complete the survey, the participation of 240 people was considered satisfactory. There were not any responds from the physicians who did not complete the survey.

Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI) is a common and popular scale used to measure people's subjective feelings about their anxiety. In 1988, Beck et al. developed the BAI. It reflects the degree of distress through the self-rating results of the participants resulting from different anxiety symptoms. BAI is a 21-item multiple-choice self-report inventory that measures common symptoms of clinical anxiety disorders such as fear of losing control and irritability in adolescents and adults (1). Every items of the BAI inventory is rated on a 4-point scale that indicates the extent to which each symptom bothers participants; answer options from 0 (not at all) to 3 (seriously, I could barely stand it). Total scores can range from 0 to 63, and higher scores indicate more severe anxiety (24). This inventory was published in Turkish by Ulusoy et al. in 1998 (21).

Data Collection Tools

The survey consisted of three parts: demographic information, the COVID-19 Pandemic Neurosurgery Clinic Activity Scale, and the Beck Anxiety Inventory. To gather the demographic information, two open-ended questions were used in addition to questions related to the personal characteristics of the physicians, the types of hospitals in which they worked, the status of their encounters with COVID-19 patients, and their provision of services.

The COVID-19 Pandemic Neurosurgery Clinic Activity Scale was prepared based on a review of the literature and the information available on the pandemic, as well as the results of preliminary interviews with neurosurgical clinic chefs and the opinions of academics on the scope and structuring of the questions. The inventory used a five-point Likert structure and was scaled from 1 (strongly disagree) to 5 (strongly agree). High scores indicated that neurosurgery clinic operations had changed more than they would have under normal circumstances. The data analysis was carried out in a 95% confidence interval.

Statistical Package for Social Sciences (SPSS) software was used in the reliability and validity analysis of the inventory. Factor analysis was conducted to determine the construct validity of the items. Validity is the extent to which a test or inventory measures the event intended to be measured (4). The inventory originally consisted of 21 questions, but 4 were taken out during factor analysis because the factor loads were low or showed incompatibility. Therefore, the inventory was validated with 17 questions. The Kaiser-Meyer-Olkin (KMO) test was performed to determine the sample size, and it

was found to be 0.601. To determine whether the correlation between the items was significant, the Bartlett's test of sphericity was used; the results were found to be significant at the level of 0.001 (approx. Chi-Square: 936,629 / df: 210 / sig: 0.000). In order to determine the size of the items, a varimax rotation was applied using the principal ingredients method.

The importance tests regarding whether the demographic and professional characteristics of neurosurgeons were impactful in the evaluation of clinical activities during the pandemic were investigated. Since the data fulfilled the parametric test assumptions, a t-test was applied for binary variables, and an Analysis of Variance (ANOVA) test was applied for multiple variables. According to the test results, gender and age had no effect on neurosurgeons' views on clinical activities during the pandemic.

The inventory items were found to have factor loads between 0.407 and 0.805. The inventory's 17 questions were grouped into four factors: the functioning of the clinic (4), the clinical approach (5), fight and protection (5), and occupational anxiety (3). The level of explained variances of the factors that made up the inventory was calculated as 48.9%. The Beck Anxiety Inventory was realized using factor analysis. The Cronbach's alpha coefficient was examined as part of the reliability analysis of the study, and it was found to be reliable with a value of 0.779. Data analysis was analyzed using frequency, significance, and correlation tests in the SPSS software package.

The findings are expressed using percentages or arithmetic means; the latter are shown in parentheses. The levels of the arithmetic averages were as follows: 1–1.8 = very low participation, 1.9–2.6 = low participation, 2.7–3.4 = medium participation, 3.5–4.2 = high participation, and 4.3–5 = very high participation.

RESULTS

The present findings and the descriptive variables for the participants are given in Table I. Of the 240 neurosurgeons who completed the survey, almost all of the participants were male, most of them were in their 40s, and half were specialists. The majority of the participants encountered COVID-19 cases, and

Table I: Frequency Tables of Participants' Defining Variables

Variable	n	%	Variable	n	%
1. Gender			**6. Is your hospital a pandemic hospital?**		
Female	20	8.3	Yes	205	85.4
Male	220	91.7	No	8	3.3
2. Age			Not a pandemic hospital, but there are COVID-19 patients	27	11.3
< 40	81	35.5	**6. Have you ever encountered COVID-19 patients?**		
40-49	94	41.2	Yes	153	63.8
50-59	53	23.2	No	87	36.3
3. Working Experience as Neurosurgeon			**7. Did you serve COVID-19 patients?**		
1-5 year	58	24.3	Yes	129	53.8
6-10 year	58	24.3	No	111	46.3
11-15 year	30	12.6	**8. Have you had the COVID 19 test?**		
16-20 year	37	15.5	Yes	43	17.9
21 < year	56	23.4	No	197	82.1
4. Type of Hospital			**9. If so, what is the result of the COVID 19 test?**		
Ministry of Health Hospital	109	45.4	Positive	3	5.3
University Hospital	76	31.7	Negative	54	94.7
Private Hospital	55	22.9	**10. If you have the disease, your condition?**		
5. Degree			In quarantine without symptoms	2	33.3
Physician Associate	20	8.3	Inpatient treatment in the service	1	16.7
Physician	120	50	Healed	3	50
Lecturer	36	15			
Associate Professor	32	13.3			
Professor	32	13.3			

most of them treated patients with COVID-19. A total of 43 participants were tested due to suspicion of COVID-19, and 3 of them tested positive. One of the infected neurosurgeons was admitted into intensive care, while the other two did not experience any symptoms; all three recovered.

Table II shows the effects of the COVID-19 pandemic on the activities of neurosurgery clinics. To understand the details of these findings, which were based on a five-point Likert scale, the arithmetic mean of the clinical activities scale and the frequency distributions are shown in the table.

The study revealed that most of the neurosurgeons could not continue routine patient acceptance (3.04 ± 1.47) or routine surgery practices (4.18 ± 1.22). In addition, elective surgery cases were postponed (4.36 ± 1.25), and only operations for emergent and cancer cases were conducted (4.32 ± 1.19).

The clinical functioning of neurosurgery clinics in non-pandemic hospitals was less affected compared to neurosurgery clinics in pandemic hospitals or non-pandemic hospitals treating cases of COVID-19 (p=0.009 error level). The protection level of neurosurgeons who encountered case of COVID-19 was higher than the level of those who did not (p=0.04 error level). The clinical functioning of neurosurgeons serving patients with COVID-19 was less affected compared to those who did not (p=0.000 error level). The protection level of neurosurgeons serving patients with COVID-19 was higher than the level of those who did not (p=0.011 error level).

In addition to the routine consent obtained prior to surgical procedures, specialized informed consent forms were also needed from symptomatic and asymptomatic patients (3.10 ± 1.79), which indicated that, that owing to the nature of COVID-19, there was an infection risk at the hospital. During the patient acceptance process for elective and urgent cases, almost all patients were checked for COVID-19 symptoms (4.17 ± 1.19) in order to prevent increased transmission and reduce and treat further morbidity prior to surgery; about half of the patients were asked to take a COVID-19 test (2.35 ± 1.51), and more than half were asked to get a thoracic computed tomography (CT) (2.99 ± 1.68). The clinical functioning of neurosurgeons serving patients with COVID-19 was less affected compared to others (p=0.000), and the level of protection of neurosurgeons handling coronavirus cases was higher than the level of others (p=0.011).

The clinical approach of the respondents who had been working between 6 and 10 years differed from those who had been working for 21 years or more (p=0.004 error level). Additionally, neurosurgeons working in private hospitals differed from neurosurgeons working at Ministry of Health or university hospitals (p=0.000 error level). In terms of anxiety states, neurosurgery specialists differed from - neurosurgery residents and academic neurosurgeons (p=0.03 error level); in terms of work-related anxiety, associate professors differed from assistant physicians (p=0.049 error level).

In the survey, the neurosurgeons were asked questions on combating COVID-19 in clinics; they stated that they engaged in positive cooperation with their colleagues (3.88 ± 1.05) and that they did not experience any personal protective equipment shortages (3.60 ± 1.40) while treating pandemic cases. In addition, the level of protection of neurosurgeons who encountered coronavirus cases (3.84) was higher than the level of those who did not (3.57) (p=0.04). There was a weak and inverse correlation between the anxiety levels of neurosurgeons and the factor related to fighting against and being protected from the pandemic (p=0.001 error level). There was a strong high and inverse relationship between neurosurgeons' protection values and their anxiety levels (p=0.001 error level). Meanwhile, there was a very weak linear relationship between neurosurgeons' anxiety values and their work-related anxiety (p=0.001 error level). As the occupational concerns of neurosurgeons increased, their anxiety levels also increased.

During the pandemic, respondents experienced occupational uneasiness due to deviation from their routine surgical schedule (4.17 ± 1.18). In addition, they stated that patients on which they had operated before the pandemic (3.62 ± 1.21) generally did not apply for routine controls, and there were severe disruptions in the post-operative patient follow-up process (3.44 ± 1.22).

Meanwhile, 87.9% of the respondents replied yes to the following question: "Has the number of patients admitted to your clinic decreased during the COVID-19 pandemic?" The number of patients admitted to the hospitals decreased due to fear about the risk of getting infected, unwillingness of the patients and advises of the government to not to go to hospitals unless it was an emergency, and decreases in home- and work-related accidents due to the curfews and self-quarantine measures.

The pandemic did not cause anxiety in 62.9% of the respondents, but it caused mild anxiety in 13.8% and moderate anxiety in 12.12%. The anxiety levels experienced by the neurosurgeons were measured using the Beck Anxiety Inventory, and the results are given in Table III.

The relationship between the anxiety levels of the neurosurgeons measured using the Beck Anxiety Inventory and the factors of the COVID-19 Pandemic Neurosurgery Clinic Activity Scale were analyzed using correlation analysis, and the results are given in Table IV.

There was a weak and inverse correlation (-0.242) between the anxiety levels of neurosurgeons and the factor related to fighting against and being protected from the pandemic (p=0.001 error level). There was a strong high and inverse relationship between neurosurgeons' protection values and their occupational anxiety levels (-0.76) (p=0.001 error level). Meanwhile, there was a very weak linear correlation (0.196) between the anxiety values and occupational anxiety levels of neurosurgeons (p=0.001 error level). As the occupational concerns of neurosurgeons increased, their anxiety levels also increased.

DISCUSSION

It is clear that the process of the COVID-19 pandemic will continue to have direct or indirect psychological and social

Table II: Frequency Distribution of the Scale of COVID-19 Pandemic Affecting Neurosurgery Clinical Activities

Statements	Investigation of the Effect of COVID-19 Pandemic on Activities in Neurosurgery Clinic										$\bar{x}$	SS
	I never agree		I do not agree		I partially agree		I Agree		I totally agree			
	n	%	n	%	n	%	n	%	n	%		
Clinical Functioning											**3.98**	**0.90**
We cannot continue routine patient admissions in the pandemic process.	55	23.1	33	13.9	49	20.6	48	20.2	53	22.3	3.04	1.47
We cannot continue our routine surgery practice during the pandemic process.	18	7.6	8	3.4	27	11.4	42	17.7	142	59.9	4.18	1.22
We postpone the operations of elective cases in the pandemic process.	18	7.5	13	5.4	12	5	18	7.5	179	74.6	4.36	1.25
In the pandemic process, we continue only the operations of emergency and cancer cases.	16	6.7	10	4.2	18	7.5	31	12.9	165	68.8	4.32	1.19
Clinical Approach											**3.02**	**0.78**
We receive a separate consent form of COVID-19 from patients who are admitted to the hospital during the pandemic process.	86	36	17	7.1	16	6.7	25	10.5	95	39.7	3.10	1.79
I am not making a specific assessment of the coronavirus when accepting cases during the pandemic process.	91	38.1	40	16.7	41	17.2	34	14.2	33	13.8	2.48	1.46
I first question the symptoms of coronavirus when accepting cases in the pandemic process.	13	5.4	12	5	37	15.5	34	14.2	143	59.8	4.17	1.19
I first request a coronavirus test when accepting cases in the pandemic process.	112	46.9	28	11.7	37	15.5	26	10.9	36	15.1	2.35	1.51
I first request a thorax CT and wait for the result while accepting the cases in the pandemic process.	83	24.7	15	6.3	34	14.2	34	14.2	73	30.5	2.99	1.68
Combating and Protecting COVID-19 in the Clinic											**3.74**	**0.74**
I do not have protective equipment shortage when I look at the pandemic cases.	30	12.6	26	10.9	41	17.2	51	21.4	90	37.8	3.60	1.40
I use protective equipment correctly in the pandemic process.	8	3.4	9	3.8	37	15.7	89	37.7	93	39.4	4.05	1.00
I think that we have a positive solidarity with our colleagues in the pandemic process.	16	6.7	12	5	42	17.6	82	34.3	87	36.4	3.88	1.05
I think healthcare system is successful in the fight against pandemic.	10	4.2	17	7.1	65	27.1	85	35.4	63	26.3	3.72	1.05
I think country policies are successful in the fight against pandemic.	11	4.6	28	11.7	86	36	69	28	45	18.8	3.45	1.06
Occupational Anxiety											**3.75**	**0.88**
I feel uncomfortable because I stay away from your routine surgery program in pandemic process.	17	7.1	3	1.3	40	16.7	41	17.2	138	57.7	4.17	1.18
Patients do not come to routine control appointments that we operated before pandemic.	16	6.7	26	10.8	64	26.7	60	25	74	30.8	3.62	1.21
We are experiencing serious disruptions in the follow-up processes of the patients we operated before pandemic.	17	7.1	39	16.3	65	27.1	58	27.2	61	25.4	3.44	1.22

impacts on people in the future. The most affected part of society is probably healthcare professionals. The pandemic has caused anxiety and stress in healthcare professionals and has had negative impacts on their mental health (7,17).

Based on the study results, that the routine clinical functioning of neurosurgery clinics was disordered and operations only were held for emergent and cancer cases. According to the respondents, many alterations were made to the clinical approach of neurosurgery clinics during the pandemic. The participants also indicated that they had a good level of protective equipment, they used protective equipment correctly, and they cooperated well with their colleagues.

Neurosurgeons felt at risk during the pandemic because they had to maintain close contact with their patients given the nature of their work. Therefore, it is natural that the neurosurgeons thought about the security measures taken by hospitals due to the pandemic and the postponement of non-emergent and non-cancer cases in terms of protecting themselves and their patients from the pandemic and reducing the risk of COVID-19 transmission in hospitals.

In a 2020 study conducted by Jean et al. on 494 neurosurgery staff from 60 countries, 52.5% of the participants stated that elective cases were delayed and routine clinical functioning was halted in the hospitals in which they worked. In the same study, 61.4% of the neurosurgery staff stated that, based on personal preference, elective cases should be postponed (10). Therefore, the results of the present study were similar to those of Jean et al.'s study in terms of clinical operation.

Moreover, the survey used in the present study yielded several notable findings. First, neurosurgeons experienced occupational uneasiness because they were deviating from their routine surgery schedules, and the majority of the patients on which they operated before the pandemic did not go for routine controls. The participants also experienced serious disruptions in the monitoring controls of these patients. The respondents also clearly stated that changes were made to their clinical approaches during the pandemic.

Second, the age and experience levels of the neurosurgeons impacted their anxiety levels. According to this finding, experience is an important determinant; likewise, prior research found that younger healthcare professionals were more likely to have higher anxiety scores than older ones (8,9,15).

The examination of the results also revealed that the majority of the participants did not feel anxious due to the COVID-19 pandemic. In a 2020 study conducted by Bostan et al. on 736 healthcare professionals, the level of anxiety caused by the pandemic was measured, and the anxiety levels of healthcare workers were found to be quite high (4.36 ± 0.841) (2). The fact that neurosurgeons had lower anxiety levels compared to other healthcare professionals could have been due to fact that neurosurgeons tend to work in difficult and stressful working environments. Similarly, previous studies have shown that other healthcare professionals, such as those who have direct contact with patients, have higher anxiety scores than physicians (8,9,15,16,19).

Another significant outcome of the present study was the respondents' assessment of the COVID-19-related policies and measures implemented by the Ministry of Health in Turkey. In order to halt the spread of COVID-19, affected countries should look at the past successes and failures of the spread of beta coronaviruses. Lessons learned from Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) outbreaks can provide valuable information on how to address the current pandemic (20). Another observation was that extending the quarantine period during a pandemic for too long may disrupts the economic and social balance of society. Therefore, in a recurring global pandemic situation, the government will be the first to want to get back to normal life and the public will be the second (18).

The present study offers valuable information about the effect of the COVID-19 pandemic on neurosurgery clinics and the anxiety levels of neurosurgeons in Turkey by providing data on the views of neurosurgeons in Turkey approximately six weeks into the pandemic. This time period is important because the pandemic reached its peak in Turkey in the sixth week (22). In this first stage of the pandemic, anxiety was at the

Table III: Evaluation of Beck Anxiety Scale Results of Neurosurgeons

Back Anxiety Scale	n	%
None	151	62.9
Mild	33	13.8
Moderate	29	12.1
Heavy	-	-

Table IV: The Relationship Between Neurosurgery Clinical Activities and Beck Anxiety Scale

	Back Anxiety	Clinical Functioning	Protection	Occupational Anxiety	Clinical Approach
Back Anxiety	1				
Clinical Functioning	.039	1			
Protection	-.242 (**)	.023	1		
Occupational Anxiety	.196 (**)	.058	-.076	1	
Clinical Approach	.054	-.049	.075	-.012	1

highest level because the disease had not yet been brought under control, leading to rapid increases in the infection and mortality rates and a great deal of uncertainty. Therefore, the study data effectively measured the level of anxiety related to the pandemic.

Limitations

The most significant limitations of the present study were that the population comprised a single group of medical practitioners and that we were unable to use face-to-face data collection methods. The neurosurgeons' excessive workload and the unwillingness of potential respondents to complete the survey created another limitation in the data collection process. In addition, data were not collected in the early stages of the outbreak, where anxiety levels may differ; This idea is supported by a previous study that found that the prevalence of psychological disorders is presented differently throughout the outbreak (13).

CONCLUSION

As long as the outbreak continues, there must be a healthy flow of information about COVID-19 and associated risk factors, and updates should be monitored so that the most current treatment methods can be used. In addition, healthcare organizations should take the necessary precautions and measures to reassure healthcare professionals and provide safer work environments. They should also provide professional support to reduce healthcare professionals' anxiety levels. In addition, telemedicine techniques should be integrated into the healthcare system to meet the routine control and other demands of neurosurgical patients at the clinical level as much as possible.

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