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Rehabilitation Processes and Health Conditions of Patients with Stroke During COVID-19 Pandemic

İnmeli Hastaların COVID-19 Pandemi Dönemindeki Rehabilitasyon Süreçleri ve Sağlık Durumları

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ABSTRACT Objective: The aim of this study was to investigate rehabilitation and treatment processes of patients followed with diagnosis of stroke during coronavirus disease-2019 (COVID-19) pandemic. **Material and Methods:** Patients who were followed in our stroke outpatient clinic, whose stroke duration was 1 year or more and patients without aphasia were included in the study. Telephone interview was made with the patients. In all patients, we questioned rehabilitation status before and after pandemic, whether they regularly perform home exercises, concerns about getting infected by COVID-19 and health problems experienced during pandemic. Demographic data, comorbid conditions, and Brunnstrom stages, Functional Ambulation Categories and Barthel Index scores within prior 6 months were extracted from patient files. **Results:** Of 134 patients participated in the study, 72.7% were attending a rehabilitation program before pandemic while only 3% could attend a rehabilitation program during pandemic. Again, 68.7% reported that they performed home exercises regularly. Of our patients, 41.8% reported that there was an increase in their contractions. One patient had COVID-19 infection and recovered without need for hospitalization. Two patients experienced a new stroke attack. Of the patients, 18.7% reported very much anxiety about getting infected by COVID-19 while 18.7% reported much anxiety, 21.6% reported some anxiety, 11.9% reported little anxiety and 29.1% reported no anxiety. When stratified according to education levels and Barthel Index score, no significant difference was found in terms of anxiety ($p>0.05$). **Conclusion:** We found that rehabilitation processes were adversely affected in stroke patients during COVID-19 pandemic. Alternative methods such as tele-rehabilitation should be developed to prevent disruption of the follow-up and rehabilitation services of these patients.

Keywords: COVID-19; stroke; rehabilitation

ÖZET Amaç: Bu çalışmanın amacı, koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisi sırasında inme tanısı ile takip edilen hastaların rehabilitasyon ve tedavi süreçlerini incelemektir. **Gereç ve Yöntemler:** Hastanemiz inme polikliniğinde takip edilen, inme süresi 1 yıl ve üzeri olan ve afazisi olmayan hastalar çalışmaya dâhil edildi. Tüm hastalar telefonla aranarak pandemiden önce ve pandemi sırasındaki rehabilitasyon durumları, evde egzersizlerini düzenli olarak yapıp yapamadıkları, COVID-19 ile enfekte olma endişeleri ve pandemi sırasında yaşanan sağlık sorunları sorgulandı. Demografik verileri, komorbiditeleri, Brunnstrom evreleri, Fonksiyonel Ambulasyon Skalaları ve son 6 ay içindeki Barthel İndeksleri hasta dosyalarından kaydedildi. **Bulgular:** Çalışmaya katılan 134 hastadan %72,7'si pandemiden önce bir rehabilitasyon programı alırken, yalnızca %3'ü pandemi sırasında rehabilitasyon programı alabilmişti. Hastaların %68,7'si düzenli olarak ev egzersizlerini yaptığını bildirdi. Hastalarımızın %41,8'i kasılmalarında artış olduğunu bildirdi. Bir hasta COVID-19 enfeksiyonu geçirmişti ve hastaneye yatmaya gerek kalmadan iyileşmişti. Bu dönemde 2 hasta yeni bir inme atağı geçirdi. Hastaların %18,7'si COVID-19 ile enfekte olma konusunda çok fazla endişeli olduğunu; %18,7'si fazla, %21,6'sı biraz, %11,9'u çok az endişeli olduğunu; %29,1'i ise hiç endişeli olmadığını bildirdi. Eğitim düzeyi ve Barthel İndeksi puanına göre sınıflandırdığımızda endişe açısından gruplar arasında anlamlı bir farklılık bulunmadı ($p>0,05$). **Sonuç:** İnme hastalarında COVID-19 pandemisi sırasında rehabilitasyon süreçlerinin olumsuz etkilendiğini saptadık. Bu hastaların takiplerinin ve rehabilitasyon hizmetlerinin aksamasını önlemek için telerehabilitasyon gibi alternatif yöntemler geliştirilmelidir.

Anahtar Kelimeler: COVID-19; inme; rehabilitasyon

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Coronavirus disease-2019 (COVID-19) was first identified at Wuhan Province, China in December, 2019 and has rapidly spread worldwide. COVID-19 pandemic significantly affected all healthcare systems within a short period.[1] Pneumonia occurs in 14-15% of these patients and 1.5-2.3% of cases result in death.[2] The patients with COVID-19 are prioritized due to need for hospitalization and intensive care. Thus, outpatient services, elective surgeries and rehabilitation services have been restricted in order to prevent collapse in healthcare system.[3-5] This largely hindered access to hospital for patients with chronic disease.

Stroke is the second leading cause of death worldwide and one of the main causes of disability.[6] The rehabilitation is started immediately after stroke and aims to ensure patients independency during daily life and in community.[7] It has become difficult to access healthcare services and rehabilitation facilities for patients with stroke during COVID-19 pandemic.

In a survey study investigating the effect of quarantine during the pandemic period on pediatric and perinatal stroke rehabilitation, it was reported that only 5.9% of 68 patients were able to continue the conventional rehabilitation program. Parents reported a perceived worsening in the child's clinical course in 32.3% of all cases.[8]

In another survey study conducted with physicians, it was reported that neurologic rehabilitation was adversely affected during the pandemic period.[9] However, we could not find a survey study evaluating the rehabilitation status of stroke patients during the pandemic period and conducted with patients in our literature search.

The aim of this study was to investigate rehabilitation and treatment processes of patients followed with diagnosis of stroke during COVID-19 pandemic. Also we aimed to contribute planning for rehabilitation and follow-up of patients with stroke during ongoing COVID-19 pandemic or similar periods that may have been experienced in the future.

MATERIAL AND METHODS

Stroke patients who applied to our outpatient clinic and were followed up between September 2018 and March 2020, and with a stroke duration of 1 year or more, were invited to the study. Patients who did not agree to participate in the study or who had aphasia were not included in the study. Patients were interviewed by phone between July 20, 2020 and August 20, 2020. While one patient out of 157 patients refused to participate, 22 patients could not be contacted by phone. In 134 patients participated, age, gender, educational status, stroke etiology, hemiplegic side, comorbidity, smoking status and Brunnstrom stages, Functional Ambulation Categories (FAC) and Barthel Index assessed within prior 6 months were extracted from patient files. Brunnstrom staging is a system that rates hand, upper extremity and lower extremity in 6 stages from 1 to 6 in order to determine motor improvement. Higher values indicate better motor recovery.[10] FAC is a scale that assess ability of ambulation in patients. It is classified in 6 categories from 0 to 5. Category 0 indicates nonfunctional ambulation, while category 5 shows full independence in ambulation.[11]

Barthel Index is a disability measure used to determine functional changes, including 10 items: Feeding, personal toileting, bathing, dressing and undressing, getting on and off a toilet, controlling bladder, controlling bowel, moving from wheelchair to bed and returning, walking on level surface (or propelling a wheelchair if unable to walk) and ascending and descending stairs. Total scores ranges from 0 to 100. Higher scores indicate higher independency. The scores of 0-20 indicate "total" dependency, 21-60 indicate "severe" dependency, 61-90 indicate "moderate" dependency, and 91-99 indicates "mild" dependency. The score of 100 is considered as "independent." Turkish version was published by Küçükdeveci et al.[12,13]

We also questioned how many days patients were going out of home before pandemic. In addition, it was asked whether they or their relatives had COVID-19 infection and whether they perceive themselves at risk for COVID-19 infection and whether they received supplemental vitamins or herbal medicines. The participants were asked to answer question regarding anxiety of getting infected as follows: I have very much anxiety, much anxiety, some anxiety, little anxiety or no anxiety. The reha-

bilitation status before and after pandemic and whether they perform home exercises regularly (30 minutes daily, at least 3 days per week) were also questioned. In addition, we also asked whether they experienced an increase in contractions and whether patients receiving botulinum toxin A (BoNT-A) injection did experience challenged in daily life due to failure to receive treatment. We also recorded whether they were able to maintain drug use and whether patients on warfarin therapy could be able to have bleeding tests including prothrombin time and international normalized ratio (INR). We also questioned whether they experienced a new stroke episode during pandemic or presented to a hospital for another reason.

The study was approved by institutional ethics committee (FSMEAH-KAEK 2020/39, 25.06.2020). The study was conducted in accordance with the principles of the Declaration of Helsinki. All participants gave verbal informed consent.

STATISTICAL ANALYSIS

The statistical analyses were performed using IBM SPSS Statistics version 22.0 (IBM SPSS, Turkey). Data distribution was assessed using Shapiro-Wilks test. Descriptive statistics are presented as mean, standard deviation and frequency. Chi-square test and Fisher Freeman Halton test were used to compare qualitative data. A p value <0.05 was considered as statistically significant.

RESULTS

Of 134 patients participated, 60 were women while 74 were men. Mean age was 57.2±14.1 years. Table 1 presents general characteristics, comorbidities, Brunnstrom stages, FAC, and Barthel Index. During pandemic, one patient stayed in nursing home while 3 patients stayed at physical medicine and rehabilitation clinic and remaining patients were at home. One patient had COVID-19 infection and recovered without need for hospitalization while 12 relatives had experienced COVID-19 infection. Table 2 presents perceived risk and anxiety for COVID-19 infection. Table 3 presents rehabilitation status before and after pandemic, health problems, hospital presentations and cause of presentation, and problems regarding healthcare and rehabilitation during pandemic.

When stratified according to education level, no significant difference was detected in anxiety level and perceived risk for COVID-19 infection (p>0.05). The rate of supplemental vitamin-medicine use was significantly higher in patients with university graduation (53.3%) than those with illiterate (16.7%), primary school (16.3%) and high-school graduation (14.3%) (p=0.004, p=0.025, p<0.05, respectively).

When stratified according to Barthel Index score, no significant difference was detected in anxiety level, perceived risk for COVID-19 infection, and rate of supplemental drug-vitamin use (p>0.05) (Table 4).

DISCUSSION

We found that rehabilitation processes were adversely affected in stroke patients during COVID-19 pandemic. Although 68.7% of patients reported that they performed home exercises regularly, 41.8% reported increase in contractions.

Stroke rehabilitation aims to achieve optimal physical, cognitive, communicative, emotional and social functioning.[14] Rehabilitation is a process that starts at early period after stroke. In a survey on healthcare providers from 55 countries, European Stroke Organization reported that stroke rehabilitation was affected by COVID-19 pandemic at acute and chronic periods.[15] In addition, long-term immobilization resulted in functional regression in patients with stroke.[16] In our study, two patients experienced new stroke episode. Since the functional status of these patients may be impaired, it is very important that rehabilitation services are not interrupted.

Spasticity is frequently seen in patients with stroke and BoNT-A injection is a safe and effective treatment modality in the management of spasticity.[17,18] There were delays in BoNT-A therapy in our patients due to COVID-19 pandemic. In a survey on 151 patients with stroke or traumatic brain injury, Santamato et al. suggested that activities, recruitment and perceived spasticity were worsened due to withdrawal of BoNT-A therapy during COVID-19 pandemic.[19] Before pandemic, 101 patients were

TABLE 1: General characteristics of patients.

		Minimum-maximum	Mean±SD (median)
Age (years)		21-83	57.2±14.1
Duration of stroke (years)		1-22	5.46±4.79 (4)
Brunstrom upper extremity		1-6	3.28±1.38 (3)
Brunstrom hand		1-6	2.5±1.62 (2)
Brunstrom lower extremity		1-6	3.66±1.3 (3)
FAC		0-5	3.64±1.62 (4)
		n	**%**
Gender	Female	60	44.8
	Male	74	55.2
Education levels	Illiterate	12	9
	Primary school	86	64.2
	High-school	21	15.7
	University	15	11.2
Stroke etiology	Ischemic	92	68.7
	Hemorrhagic	42	31.3
Side of paresis	Right	57	42.5
	Left	74	55.2
	Bilateral	3	2.2
Comorbidity	Presence	111	82.8
	Absent	23	17.2
Comorbidities (n=111)	Hypertension	88	79.3
	Diabetes mellitus	37	33.3
	CVD	38	34.2
	Other	28	25.2
Barthel index	Total dependency	5	3.7
	Severe dependency	35	26.1
	Moderate dependency	65	48.5
	Mild dependency	21	15.7
	Independency	8	6.0

SD: Standard deviation; CVD: Cardiovascular disease; FAC: Functional ambulation categories.

receiving BoNT-A injections in our study. Of these, 95 patients experienced delays in BoNT-a therapy, 68 of these 95 patients (71.6%) reported worsening in daily life due to delay in BoNT-A injections. Overall, 56 (41.8%) of 134 patients reported an increase in contractions. Although 68.7% of patients reported that they performed home exercises regularly, only 4 patients could be able to attend rehabilitation and patients were more immobile due to curfew. We think that all above-mentioned factors contributed to the increase in contractions.

Kubota et al. reported that the COVID-19 infection was severe in 86 (19.3%) of 445 patients who had cerebrovascular disease. Authors proposed that this may be due to advanced aged and presence of comorbid conditions such as diabetes mellitus and hypertension.[2] In our study, only one patient (68-years old male patient) had COVID-19 infection. This patient with hypertension recovered without the need for hospitalization. We think that the infection rate was low in our study because the patients were protected from the pandemic by staying at home. 98.5% of our patients were able to maintain their medication. However, 5 of 12 patients on warfarin therapy reported that they could not be able to have regular INR tests. Warfarin has interactions with several

TABLE 2: Patients or relatives experienced COVID-19 and perceived risk and anxiety for COVID-19 infection.

		n	%
Diagnosis of COVID-19 infection	Yes	1	0.7
	No	133	99.3
Diagnosed with COVID-19 infection in their environment (n=12)	Family members	2	16.7
	Relatives	9	75
	Other	1	8.3
Patients thinking that they are in high-risk group for COVID-19 infection due stroke	Yes	82	61.2
	No	52	38.8
Anxiety status for getting infected COVID-19	Very much anxiety	25	18.7
	Much anxiety	25	18.7
	Some anxiety	29	21.6
	Little anxiety	16	11.9
	No anxiety	39	29.1
Supplemental drug-vitamin use for protection against COVID-19 infection	Yes	27	20.1
	No	107	79.9
Supplemental drug-vitamin used for protection against COVID-19 infection (n=27)	Vitamin D	16	59.3
	Vitamin C	4	14.8
	Multi-vitamin	11	40.7
	Herbal supplementation	5	18.5

drugs and foods, and INR should be monitored closely. No complication occurred in our patients due to delay in INR monitoring; however, it should be noted that INR monitoring must be kept in mind in patients on warfarin therapy.

Neurological involvement is not infrequent in COVID-19 infection. It may cause severe complications if not detected early. Occasionally, it may be present before onset of respiratory symptoms or single symptom in COVID-19 patients.[20] Thus, clinicians should be careful in this issue and consider that stroke patients may present with a new neurological event during pandemic.

In recent years, as similar to many fields, telemedicine and tele-rehabilitation modalities are also advancing in healthcare and rehabilitation by increasing use of technology.[21] Tele-rehabilitation has gained importance in conditions where access to rehabilitation centers and transfers are challenging.[22] In a randomized, clinical study on patients with stroke, Cramer et al. compared tele-rehabilitation with traditional rehabilitation interventions. Authors found significant improvements in upper extremity motor function in both treatment groups and demonstrated that tele-rehabilitation was as effective as in-hospital rehabilitation.[23] Tele-rehabilitation seems to be a good alternative to prevent disruption of rehabilitation processes in patients with stroke. However, it may not be possible to access all patients. In studies on effectiveness of home-based rehabilitation, it was suggested that home exercise programs can facilitate recovery. In addition, it was proposed that it can reduce the risk for disability and depression in addition to improvements in functional activities.[24] Thus, it is important to inform patients about the value of exercises and to arrange exercise programs. It was reported that anxiety and depression affected more than 50% of patients with stroke. During pandemics, psychological problems may be increased in patients, influencing rehabilitation adversely.[25,26] In our study, it was found that 29.1% of patients experienced no anxiety about getting infected while remaining patients experienced little, much or very much anxiety. We found that feeling concerned was not associated with educational status and independence level. The fact that we used no scale to measure anxiety level is a limitation of our study. However, it should be suggested that mental health should be considered in all patients with stroke during pandemic.

TABLE 3: Rehabilitation status before and after pandemic and health problems during pandemic.

		n	%
Mobilization status before pandemic	At least 3 days a week	78	58.2
	1 day a week	21	15.7
	1 or 2 per month	5	3.7
	Stay at home unless control visit	30	22.4
Attendance status to rehabilitation before pandemic	Yes	98	73.1
	No	36	26.9
Rehabilitation program received before pandemic (n=98)	In-patient	17	17.3
	Outpatient	67	68.4
	Physiotherapist visits at home	14	14.3
Attendance status to rehabilitation during pandemic	Yes	4	3
	No	130	97
Regular home exercise performance during pandemic	Yes	92	68.7
	No	42	31.3
Presentation to a hospital for another reason during pandemic	Yes	18	13.4
	No	116	86.6
Cause of hospital presentation during pandemic	Skin lesion	1	5.6
	Cough	3	16.7
	Musculoskeletal pain	3	16.7
	Vertigo, headache	2	11.1
	Syncope	1	5.6
	Pain at eear	1	5.6
	Ocular complaints	1	5.6
	Abdominal pain	1	5.6
	Toothache	1	5.6
	Dysuria	4	22.2
Maintaining chronic medications	Yes	132	98.5
	No	2	1.5
New stroke episode during pandemic	Yes	2	1.5
	No	132	98.5
Having regular INR tests in patients on warfarin therapy (n=12)	Yes	7	58.3
	No	5	41.7
Patients with increased musculoskeletal pain	Yes	41	30.6
	No	93	69.4
Increase in contractions	Yes	56	41.8
	No	78	58.2
Patients received BoNT-A injection before pandemic	Yes	101	75.4
	No	33	24.6
Patients with delay in BoNT-A injections during pandemic (n=101)	Yes	95	94.1
	No	6	5.9
Patients reporting worsening in daily activities due to failure to receive BoNT-A injection (n=95)	Yes	68	71.6
	No	27	28.4

INR: International normalized ratio; BoNT-A: Botulinum toxin A.

TABLE 4: Assessment of questions related to COVID-19 according to Barthel Index levels.

		Barthel Index					
		Total dependency	Severe dependency	Moderate dependency	Mild dependency	Independency	
		n (%)	n (%)	n (%)	n (%)	n (%)	p value
Anxiety regarding getting infected by COVID-19	Very much anxiety	1 (25)	2 (6.3)	13 (20)	6 (31.6)	3 (37.5)	**0.228**
	Much anxiety	0 (0)	4 (12.5)	12 (18.5)	3 (15.8)	2 (25)	
	Some anxiety	0 (0)	7 (21.9)	19 (29.2)	3 (15.8)	0 (0)	
	Little anxiety	1 (25)	7 (21.9)	4 (6.2)	2 (10.5)	2 (25)	
	No anxiety	2 (50)	12 (37.5)	17 (26.2)	5 (26.3)	1 (12.5)	
Thought to be in high-risk for COVID-19 infection due to stroke	Yes	2 (50)	20 (62.5)	37 (56.9)	13 (68.4)	7 (87.5)	**0.490**
	No	2 (50)	12 (37.5)	28 (43.1)	6 (31.6)	1 (12.5)	
Supplemental drug / vitamin use for protection against COVID-19 infection	Yes	2 (50)	4 (12.5)	11 (16.9)	5 (26.3)	4 (50)	**0.063**
	No	2 (50)	28 (87.5)	54 (83.1)	14 (73.7)	4 (50)	

*p<0.05

Of our patients, 38.8% thought that they did not have a risk for COVID-19. As these patients are at risk for more severe COVID-19 infection, it is important to inform the patients. Thus, they may be more careful and obey infection protection measures.

One of the limitations of our study is that we did not evaluate the ambulation situations and independence in activities of daily living during the pandemic period. Due to the pandemic conditions and our study's being a survey study, we could not evaluate the patients by examination. We evaluated the increase in spasticity and pain according to the perceptions of the patients which is another limitation of our study.

CONCLUSION

In conclusion, we found that there was a disruption in the rehabilitation processes of stroke patients in the first months of the pandemic in our country. Stroke is an important, chronic health problem that adversely affects quality of life by leading to functional and neurological losses in patients. Patients with stroke are in a high-risk group where COVID-19 infection and complications are more commonly observed. Thus, measures should be taken and alternative methods should be developed to maintain follow-up and rehabilitation services. Since it will be risky for patients to leave the home during the pandemic, they should be informed about the importance of regular home exercises.

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