

Impact of Physiotherapy Absence in COVID-19 Pandemic on Neurological State of Patients With Parkinson Disease

Alen Kapel, MSc, PT; Domen Serdoner, MSc, PT; Ester Fabiani, MSc, PT; Tomaz Velnar, PhD, MD

The purpose of this study was to demonstrate the impact of COVID-19 pandemic restrictions on patients with Parkinson disease in the absence of physiotherapy interventions. We analyzed 42 patient surveys on motor and mental aspects in the neurological state. The survey was conducted in 3 primary care-level clinics specialized in neurological rehabilitation in the seventh week of COVID-19 restrictions, which started on March 13, 2020. A number of deteriorations, worsening of disorder, and emerging conditions were found. The absence of physiotherapy interventions in COVID-19 restrictions had a significant multidimensional impact on the neurological state of patients with Parkinson disease.

Key words: COVID-19, health care, Parkinson disease, rehabilitation

Coronavirus (CoV) is a large family of viruses that cause a series of pathologies including cold and other severe complications such as Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV).^{1,8} COVID-19 was first identified in December 2019 and later on March 11, 2020, the World Health Organization characterized it as a pandemic.^{1,4,7-10} Because of its mode of transmission and an exponential mortality rate, countries formed and established restrictions that embraced the entire aspect of life. One of several modifications included the absence of health interventions and establishment of telephone consultations. As neurological disorders are being increased in incidence for several years, these patients also experienced modified approaches in handling their condition.^{3,4,11} The purpose of this study was first to demonstrate the impact of COVID-19 pandemic restrictions, resulting in the absence of physiotherapy interventions, on patients with Parkinson disease (PD); second, to define SARS-CoV-2 and

PD; and third, to practically research the level of gait state and relevance of neurological rehabilitation (physiotherapy) consistency. The goal of this study was to introduce the outcomes of physiotherapy absence in the COVID-19 pandemic.

Neurological disorders are diseases affecting the central and peripheral nervous systems that result in various impairments, leading to paralysis, muscle weakness, and impairments in sensory integration including the somatosensory and vestibular systems.¹¹ Seizures and altered levels of consciousness also have a significant role. Disorders affect brain and spinal cord, cranial and peripheral nerves, muscles, and the autonomic nervous system.¹² Symptoms depend on structural, biochemical, and electrical activities in the brain, spinal cord, or other organs.^{11,12} Neurological diseases almost always damage control systems, which induce posture and motor impairments featuring voluntary movement.¹³ When this occurs, difficulties organizing appropriate targeted activity patterns and postural control occur.¹² The most frequently mentioned neurological disorders are stroke, traumatic brain injury, spinal cord injuries, multiple sclerosis, PD, dementia, epilepsy, and cerebral palsy.¹³ PD is a chronic progressive neurodegenerative movement disease/disorder manifested by motor symptoms due to loss of dopaminergic neurons.¹⁴⁻¹⁶ It is defined by 4 primary motor symptoms such as bradykinesia, resting tremor, rigidity, and postural instability/impairments.^{17,18} Secondary motor characteristics are freezing of gait (FOG) and reduction in balance and speech performance.^{14,16,18} Alongside motor symptoms, PD also incorporates nonmotor symptoms such as sleep disturbances, perceptual dysfunction, and mental impairments (emotional disturbances, depression, anxiety).^{15,18} Heterogeneity of PD is due to the predominant phenomenon of tremor and associated features of rigidity and bradykinesia.¹⁶⁻¹⁸ It has no disease-modifying therapies and is caused by dopamine reduction in dorsal striatum leading to motor and nonmotor symptoms; progression is faster in patients with rigidity and bradykinesia and slower in patients with predominant tremor.¹⁴⁻¹⁶ Motor impairments in PD start with reduced automaticity of walking; therefore, this motor skill requires more projected handling due to challenges in motor tasks such as turning and dual-tasking.¹⁶⁻¹⁸ Bradykinetic features

Author Affiliations: Alma Mater Europaea-ECM Maribor, Maribor, Slovenia (Messrs Kapel and Serdoner, Ms Fabiani, and Dr Velnar); Modus Medical, Maribor, Slovenia (Mr Kapel); Institute for Education, Work and Care Dornava, Dornava, Slovenia (Mr Serdoner); and Departments of Infectious Diseases (Ms Fabiani) and Neurosurgery (Dr Velnar), University Medical Centre Ljubljana, Ljubljana, Slovenia.

The authors declare no conflicts of interest.

Correspondence: Alen Kapel, MSc, PT, Modus Medical, Zitna ulica 10, Maribor 2000, Slovenia (alen.kapel@icloud.com).

show reduction in trunk rotation, decreased joint range of motion in swing and gait velocity, and feet shuffling. Reduced swing is the most sensitive early sign of gait impairment.¹⁷ Lack of stepping is one of the most often presenting causes of reduced gait, but recent studies have shown that despite lack of stepping, lack of stepping in connection with trembling of the legs has severe impact on the emergence of FOG.^{16,17} FOG is a motor symptom/impairment experienced by 50% to 80% of patients with PD.^{14,15} Cause of FOG is a contribution of environmental, motor phenotype, cognitive load, and emotional states; thus, all 4 characteristics provide the base for FOG pathogenesis.¹⁵ Gait regression starts with reduced length of step, which continues in its height and ends with freezing episodes. It implicates in decrease of mobility and incidence of falls and related injuries.¹⁹ FOG is always a motor phenomenon; recent studies have shown different aspects of FOG and classified it as an anxiety-associated (presence, severity, and progression) state of motor impairment.¹⁵ Anxiety is one of the clinically significant psychiatric syndromes in PD that impacts dependency and influences poor quality of life.²⁰ It is also known as one of the most common overlooked or undetected complex syndromes in motor and autonomic impairments, which are associated with increased motor fluctuations, gait disturbances, FOG and postural impairments, bradykinesia, and rigidity.^{15-17,20} Recent studies show that anxiety is present in 1.9% to 18% of general public, and its prevalence is higher in persons with PD.^{20,21}

METHODS

In this research, the impact of COVID-19 pandemic restrictions, resulting in the absence of physiotherapy interventions, on patients with PD was studied.

In this study, we evaluated 42 patients with PD who were administered a 13-question survey for monitoring their condition in the seventh week of COVID-19 restrictions, which started on March 13, 2020, and when all physiotherapy interventions were absent. The survey was conducted with patients in 3 primary care-level clinics specialized in neurological rehabilitation and consisted of motor state, usage of orthopedic props, deteriorations and reduction in motor functions, fall incidence, number of hospital admissions, impact of hands-on therapy absence, gait ability, sleeping disorders, and prevalence of behavior disorders. The survey was influenced and modified on the basis of a research conducted in 2018 by 2 doctors from the Netherlands and Belgium who introduced a figure-of-five factor influencing the effectiveness of a so-called nonpharmacological intervention—physical activity (PA).¹⁹

This study was conducted in accordance with the principles of International Code of Medical Ethics and the Helsinki/Tokyo Declaration. Data were obtained with the informed consent of all participants.

Statistical analysis

Data were statistically processed using the SPSS software (Statistical Package for the Social Sciences, version 21) and presented with table demonstrations.

RESULTS

In this study, 42 patients with PD, aged between 41 and 78 years, in the seventh week of COVID-19 restrictions, which started on March 13, 2020, participated in a survey for monitoring their condition. Evaluation was done using a 13-question long survey administered through telephone consultation or video consultation. The survey focused on patient motor state, usage of orthopedic props, impact of COVID-19 on deteriorations, reduction in motor functions, fall incidence, number of hospital admissions, impact of hands-on therapy absence, gait ability, sleeping disorders, and the prevalence of behavior disorders.

The Table shows that 57.1% of patients were immobile or could stand with assistance before COVID-19 epidemic restrictions. In total, 62% of patients at that time were using a walker (28.5%) or walking poles (28.5%) for standing or walking ability. The impact of absent interventions was on motor function in 73.8% of patients; 61.9% had mental state impairments such as depression and anxiety. It was found that 21.4% of patients with PD also had 1 to 3 days of existential crisis. Deterioration of motor function was reported in 90.4% of patients with PD, and a greater incidence of falls was noted in 55.6% of mobile patients while 3 of 12 individuals (28.5%) were admitted to the hospital due to trauma. Two of these 12 individuals became immobile when they were discharged home. Decrease in motivation manifested in 40.4% of patients, whereas loss of achieved motor function was detected in 80.9% of individuals with PD. Incidence of sleeping disorders increased in 56.3% of patients during restrictions. The same was observed for behavior disorders, whereas the prevalence increased for 50% of patients.

DISCUSSION

The COVID-19 pandemic demanded several changes in the lives of an individual at the state, national, and global levels. Not only it demanded extreme changes in life and social distancing but it also forced several organizations to restructure their already established practice.¹⁻⁴ Health care is one of the most affected areas during the COVID-19 pandemic, as well as individuals who were/are COVID-19 positive and individuals who were undertaking medical, rehabilitation, and other related interventions either in public or private health sector, including stay-at-home patients and those who were admitted. Neurological disorders are one of the several health states that were affected on a greater scale, being increased in incidence for several years.¹¹⁻¹³ This research focused on difficulties and deteriorations in PD patients while their intervention procedure

TABLE Evaluation Results of Patients With Parkinson Disease				
Question	Topic	Variable	Number of Patients With PD	
			n	%
Q1	Evaluated patients		42	100.0
Q2	Patients with immobility and/or assisted standing ability		24	57.1
Q3	Usage of orthopedic props	Walker	12	28.5
		Walking poles	26	61.9
Q4	Impact of COVID-19 pandemic on PD impairments	Cognitive state	5	11.9
		Mental state	26	61.9
		Motor function	31	73.8
		Other	0	0.0
Q5	Decrease in motor function		38	90.4
Q6	Increase in incidence of falls within mobile patients	Yes	10	55.6
		No	8	44.4
Q7	Number of admitted PD patients in 7 wk time of COVID-19 restrictions		12	28.5
Q8	Impact of physiotherapy absence on patients with PD	Prevalence in anxiety and stress	10	23.8
		Communication skill	0	0.0
		Decrease in motivation	17	40.4
		Existential crisis	9	21.4
		Loss of achieved motor functions	34	80.9
		Other	0	0.0
Q9	Decrease in gait ability in PD patients		28	66.6
Q10	Prevalence of sleeping disorders before physiotherapy absence		18	42.8
Q11	Prevalence of sleeping disorders in 7 wk time of physiotherapy absence		32	76.1
Q12	Prevalence of behavioral disorders before physiotherapy absence		20	47.6
Q13	Prevalence of behavioral disorders in 7-wk time of physiotherapy absence		40	95.2

Abbreviation: PD, Parkinson disease.

was absent. It is known that PD involves a complex form of pathologies that demand a wide spectrum of consistent interventions that were put on hold or were widely modified because of COVID-19. Neurorehabilitation is a subject of personalized and individual approach in intervention.^{12,22} The goal is to promote recovery from neural injuries or to compensate for any resulting functional changes in motor, cognitive, and speech.^{12,15} Rehabilitation is therefore a wide and complex individual process that occurs over multiple periods of time and involves spontaneous and learning-dependent individual improvements.^{19,22} Such an approach is required in health care and also defined as regular prac-

tice. The COVID-19 pandemic caused several modifications in this matter, causing unbeneficial and deteriorating impact on patients. Management of PD demands an interdisciplinary and consistently monitored approach involving pharmacological and nonpharmacological interventions, while nonpharmacological interventions refer to tailored PA.¹⁹ The association between PD and PA in recent studies is presented as a new medical modality in reducing PD-related impairments.¹⁹ Exercise affects nigrostriatal pathway by increasing the release of dopamine, increasing extracellular dopamine through downregulation of dopamine transporter expression, reducing striatal dopamine

loss and partial preservation of midbrain dopaminergic neurons, and preserving or restoring dopamine terminals.²²⁻²⁴ Exercise incorporates several vascular and neuromolecular changes in the brain that result in improved cognitive and behavioral functions. This enhancement also results in physiological changes (aerobic fitness and strength), clinical changes (motor and nonmotor symptoms), functional changes (gait and falls), and neuroplasticity changes.¹⁹ Exercise cannot be used toward mitigation of the brain's aging process, but it can have detrimental and deleterious systemic and cellular effects, therefore managing functions of mechanisms involved in aging.^{19,22}

PA in PD has to be personalized because of its heterogeneous phenotype or pathological state; therefore, because of numerous dimensions, personal and individual exercise plans and interventions are of utmost importance.^{22,24} Optimal intensity, duration, setting (location), and frequency of intervention have to be determined before and between the intervention for achieving significant improvements.¹⁹ Using "one-size-fits-all" exercise program leads not only to limited improvements but can also provide significant, occasionally irreversible, outcomes.^{19,22,25-28} These procedures have been disabled in this pandemic time, due to the absence of hands-on interventions and establishment of telephone consultations. Telephone consultations in our opinion do not allow an effective rehabilitation, especially in neurological patients, since the absence of facilitation and also in the vast majority of patients limited cooperation, understanding, and motivation are required. Such interventions lead to poor performance in motor patterns that reinforce pathological compensatory mechanisms. A recent American study researched the impact of physiotherapy on unsupervised home exercises, group training, and an individual approach.²⁹ Unsupervised home exercises (patients were given instructions only at the start of the project) had no significant benefit. Patients who were included in the group training benefited in gait ability. The most significant benefit was noted in patients who were included in the individual hands-on approach. It was found that in order to improve gait ability, when individual hands-on intervention is not available, group training is favorable. But it was found in complex disease impairments that individual intervention is the best option in reducing extensiveness and intensity of PD.²⁹

Our evaluated patients had a wide range of deteriorations involving not only motor function, ability, and a greater incidence of falls but also worsening in behavior disorders and motivation, incidence of existential crisis, sleeping disorders, and also numerous appearances of mental state impairments referring to depression and anxiety. A recent study showed that fall prevalence in patients with PD and anxiety is far more common than in patients who suffer only from PD.^{20,30} The incidence of anxiety in

PD is associated with several implications of PD relevant to physical disabilities, embarrassment due to motor and somatic impairments, freezing periods, panic attacks, and falling.^{15,20,30,31} All these states can be reduced or prevented by means of individual hands-on help of a health professional. Also, neurologists and physiotherapists are well educated in this matter and have a wide spectrum of knowledge that can be used in personal discussions. But difficulty was encountered when education was provided through a phone call, which is a regular practice in the COVID-19 pandemic. A study conducted in Australia researched the prevalence of anxiety in young and older patients and found that anxiety is more plausible in young patients. That study showed that the prevalence of anxiety in PD patients younger than 62 years is higher than in patients older than 62 years.³² Richard et al³³ also researched the association between motor functions and anxiety in patients with PD, in which they found that 75% of involved patients had a positive impact of anxiety on motor functions and impairments.³³ A recent Australian study found that 80% of the sample, which included patients with anxiety and PD, had worsening in motor ability and their motor impairments aggravated because of mental disorder.²⁰ Evaluated patients in our study also had an increased incidence of falls and FOG phenomenon, whereby 3 of 12 individuals were admitted to the hospital due to vertebral, coxal, and head trauma and 2 of those individuals became immobile when discharged from the health facility.

Studies show that motor functions also refer FOG, which is a biomechanical phenomenon, along with biochemical fundamentals, in connection with the prevalence of anxiety.¹⁵ Anxiety and PD are affiliated with reduction in neurotransmitters such as dopamine, serotonin, and noradrenaline; thus, their decrease in production and distribution implicate structures in basal ganglia associated with motor and nonmotor impairments of PD symptoms. Anxiety overloads limbic inputs into the striatum and consequently interferes with competing information processing within the basal ganglia.^{20,30} Basal ganglia enable voluntary motor control, eye movement, and procedural learning and also impact emotional and cognitive functions.²⁰ Anxiety is also presented as a prevalent nonmotor impairment and complication in PD with significant impact on decreasing quality of life. FOG is experienced in situations when a person with PD is present in narrow and dark spaces or is under the influence of time—time constraints.^{15,19,20}

Our research also investigated the state of incidence in sleeping disorders and decreased motivation, whereby both increased and therefore substantially changed the intervention process and future participation. These distresses have a significant impact on the progression of PD. Exercise should be encouraged and prescribed in all

patients with PD considering motor symptoms, risk of falls, apathy, fatigue, depression, and cognitive dysfunction.³⁴ These symptoms can reduce involvement in PA.³⁵ This correlates also to our prognosis of intervention in patients with decreased motivation, behavior disorders, and mental state impairments.³⁶ Studies show that lifestyle changes and generating a healthy mindset should be part of the first intervention on which medical professionals should focus their attention for the purpose of mitigating PD impairments and possible neglect of participation.^{37,38} Unsupervised, uncoordinated, unplanned, and non-goal-focused intervention can lead to decrease in interest, which, as studies show, contribute to manifestation of sedentary lifestyle and consequently impact on the progression of PD.³⁴ Studies even show the incidence of sedentary level in PD being high, by which 30% of patients achieve not more than 30 minutes of walking or standing per day, while posture has a significant role in functional mobility. It was found that decreased postural stability induces balance problems, which manifest in fall incidents.¹⁷ A retrospective study reported the incidence of falls for 12 months in 489 PD patients who were admitted to the Department of Neurology. Findings pointed on at least one fall per individual over 12 months.¹⁷ Although it was also discovered that a high incidence of falls (40%-70%) is present in early-stage PD patients, different studies show that in minimally supervised intervention, patients with complex and intensive impairment experience more falls than patients with lower severity of PD.^{17,39,40}

CONCLUSION

As shown in this study, COVID-19 and its restrictions, resulting in the absence of physiotherapy interventions in patients with PD, had a multidimensional impact. Several deteriorations, worsening of disorders, and emerging conditions referring to the state of motor function, usage of orthopedic props, fall incidents, hospital admissions, individual hands-on intervention, gait ability, sleeping disorders, and the prevalence of behavior disorders were found within this research study. We emphasize that future studies are of utmost importance for understating the severity of COVID-19 within health care systems regarding patients with PD.

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