Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Parkinsonism and Related Disorders 80 (2020) 7–9

Contents lists available at ScienceDirect

Parkinsonism and Related Disorders

journal homepage: www.elsevier.com/locate/parkreldis

Correspondence

COVID-19 in Parkinson's disease: Report on prevalence and outcome

ARTICLE INFO

Keywords
Parkinson's disease
COVID-19
Infection

Coronavirus Disease-2019 (COVID-19) is a global pandemic with more than five million confirmed cases worldwide. COVID-19 has had a relevant impact in the field of Neurology, challenging the management of patients with chronic neurologic conditions who have, or are at risk for, the infection [1,2]. Parkinson's disease (PD), affecting 1–2 per 1000 of the population at any time, and 1% of the population above 60 years, is the second most common neurodegenerative disease, with over 250,000 patients in Italy, and over 1,000,000 in USA. The potential neurotropism of COVID-19 and the finding of antibodies against coronavirus in the cerebrospinal fluid of PD patients prompted questions about the susceptibility of PD patients to COVID-19 [2–6]. To date, only two case series for a total of 12 PD patients and one community-based study were published about PD and COVID-19 [3,4,6], suggesting worsening of motor and non-motor symptoms and an association between higher mortality rates (40%) and older age and longer PD duration [3,4]. Also, a recent large case-control study performed on a single-center in Lombardy, Italy, reported an interview to non-advanced PD patients [5]. The authors found a similar rate of infection in PD patients and controls and suggest that COVID-19 risk and mortality did not differ from the general population. However, the prevalence of PD patients affected by COVID-19 is still unknown [1].

Here, we aimed to estimate the prevalence of COVID-19 in a large population of PD patients and compare the infection rate with the general population of the same region. To this end, we interviewed a large cohort of PD patients living in Piedmont, a northern Italian region presenting the second-highest number of COVID-19 cases in Italy after Lombardy, and having a population of 4,356,406, with an estimated number of PD patients of about 13,000–15,000. The regional section of the Italian Association of Parkinsonian patients reached out by phone and interviewed 1,407 PD patients (or their caregivers) on 4–6 May 2020, asking for a laboratory-confirmed diagnosis of COVID-19. This screening interview was conducted spontaneously by the Association, which involved all members reachable by phone, in the absence of any selection criterion. Aggregated data provided by the association about members were: 62% males, 47% of patients with an age >75 years, disease duration ranging from 1 to >25 years, 1% in nursing home. This information makes of the interviewees a heterogeneous cohort of PD patients living in Piedmont, and we do not see potentially relevant selection bias in terms of sex, age, income, disease duration, or disease stage since the association includes all PD patients and their families on a volunteer basis and without limitations related to demographic or clinical features.

In cases of confirmed positivity to COVID-19, the Association asked for the possibility of data collection for research purposes, and information on PD, therapy, comorbidities, and outcome was retrieved by an experienced neurologist (C.A.A.) by a semi-structured phone interview. The Local Ethical Committee approved the study, and all participants interviewed for research purposes provided a documented and witnessed verbal informed consent, obtained after a structured and detailed explanation of objectives and use of data, according to the guidelines of the Declaration of Helsinki.

Eight PD patients, meaning 0.57% of interviewed, were found to be positive to COVID-19. The number of positive cases in Piedmont at the date of May 4, 2020 was 27,622, with a prevalence of 0.63%. 75% of PD patients (n = 6/8) died because of COVID-19, while the mortality rate in the general population of Piedmont was 11.53% (n = 3186/27,622). Demographic and clinical data of infected PD patients are reported in Table 1. PD symptoms worsened in all patients, early before or early after the onset of infection signs, which consisted in fever (100% of patients), weakness (43%), muscle pain (29%), dyspnea (29%), and cough (14%). Interestingly, one patient developed disabling dyskinesia as the presenting symptom of the infection. All patients were hospitalized, and three were already institutionalized at the moment of infection. All were treated with levodopa, alone or in combination with dopamine agonists. One patient was treated with levodopa/carbidopa intestinal gel infusion plus entacapone. PD therapy was modified in two cases: in one case, the dosage of levodopa was increased, while in the other dopaminergic therapy was stopped as the patient's conditions worsened.

To our knowledge, this is the first report of the prevalence of confirmed COVID-19 cases in a large cohort of PD patients living in a specific geographic area. Notably, the prevalence was equivalent to that of the general population. Whether a similar prevalence is related to the same predisposition for COVID-19 infection or to a higher level of attention and self-isolation in PD patients (as an at-risk population) cannot be elucidated by our data. However, differently from a previous similar study, we found a high rate of mortality among PD patients [5]. This discrepancy might be due to the fact that the study of Lombardy

https://doi.org/10.1016/j.parkreldis.2020.09.008
Received 10 June 2020; Received in revised form 22 August 2020; Accepted 4 September 2020
Available online 6 September 2020

Table 1
Demographic and clinical information of parkinsonian patients with COVID-19.

Patient	Sex	Age	PD duration	Comorbidities	PD Therapy	Institutionalization	COVID-19 symptoms	Worsening of PD	Change of PD therapy	Outcome
1	F	64	5	Hypertension	Levodopa/ carbidopa, Pramipexole	No	Fever, Asthenia, Muscle pain	No	No	Recovery
2	M	77	20	Lung neoplasm (steady - in follow-up)	Levodopa/ carbidopa	Yes	Fever, Asthenia, Cough, Dyspnea	Yes: dysphagia and inability to stand	Yes: stopped after infection worsening	Death
3	F	74	3	Depression	Levodopa/ benserazide, Pramipexole	No	Fever, Asthenia, Muscle pain	Yes: worsening of rigidity and bradykinesia	No	Death
4	M	63	21	Diabetes in diet therapy	Melevodopa/ carbidopa	Yes	Fever, Dyspnea	Not assessable: patients already bedridden and fed with PEG	No	Death
5	F	81	16	Hypertension, hyperhomocysteinemia	Levodopa/ carbidopa gel intestinal infusion, Entacapone	No	Fever, Dyspnea	Yes: onset of disabling dyskinesia	No	Death
6	M	79	15	NA	Levodopa/ carbidopa	NA	NA	NA	NA	Death
7*	M	80	5	Hypertension, atrial fibrillation, benign prostatic hyperplasia	Levodopa/ carbidopa	Yes	Fever, cough	Yes: in particular worsening of dysphagia	Yes: increase in levodopa dose	Recovery
8	M	NA	NA	NA	NA	NA	NA	NA	NA	Death

PEG: percutaneous endoscopic gastrostomy.
NA: information not available.
*The patient reported some atypical parkinsonian symptoms/signs.
Caregivers of patients #6 and #8 did not accept to disclose further information, except those reported in the Table.

patients did not consider advanced PD patients and those living in nursing homes or other long-term care facilities. On the other hand, another study considering the outcome of PD patients affected by COVID-19 found a 'substantially high mortality rate (40%)', suggesting that older age and longer disease duration might be predictors of worse outcomes [3]. Limitations intrinsic to this kind of study notwithstanding, our data might cautiously suggest that PD patients should not be necessarily considered at higher risk for developing COVID-19, but might be at higher risk for a worse outcome, especially if they have a long PD duration. Further studies on larger cohorts of PD patients affected by COVID-19 are needed to confirm this finding.

Funding sources

Nothing to declare.

Financial disclosure related to research covered in this article

None.

Financial disclosures

Dr. Artusi has received travel grants from Zambon and Abbvie, and educational grants from Ralpharma and Neuraxpharm.

Dr Romagnolo has received grant support and speaker honoraria from AbbVie, speaker honoraria from Chiesi Farmaceutici and travel grants from Lusofarmaco, Chiesi Farmaceutici, Medtronic, and UCB Pharma.

Dr. Marchet has no financial disclosures.

Gabriele Imabalzano has no financial disclosures.

Maurizio Zibetti has received honoraria from Medtronic, Zambon, UCB Pharma, and AbbVie.

Mario Giorgio Rizzone has received honoraria from Medtronic and UCB Pharma.

Dr. Lopiano has received honoraria for lecturing and travel grants from Medtronic, UCB Pharma, and AbbVie.

Authors' roles

Carlo Alberto Artusi MD, University of Torino, Design and conceptualized study; interpreted the data; drafted the manuscript for intellectual content. Alberto Romagnolo MD, University of Torino, Analyzed the data; interpreted the data; drafted the manuscript for intellectual content. Alberto Marchet, MD, Martini Hospital, Torino, Major role in the acquisition of data; revised the manuscript for intellectual content. Gabriele Imbalzano MD, University of Torino, Major role in the acquisition of data; revised the manuscript for intellectual content. Maurizio Zibetti MD, PhD, University of Torino, Analyzed the data; interpreted the data; revised the manuscript for intellectual content. Mario Giorgio Rizzone MD, University of Torino, Analyzed the data; interpreted the data; revised the manuscript for intellectual content. Leonardo Lopiano MD, PhD, University of Torino, Design and conceptualized study; interpreted the data; revised the manuscript for intellectual content. All the co-authors listed above gave their final approval of this manuscript version.

Ethics

The Local Ethical Committee approved the study protocol, and patients provided verbal informed consent.

Data access and responsibility statement

C.A. Artusi had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Acknowledgment

The Authors would like to express their gratitude to the personnel

and all the members of the "Associazione Amici Parkinsoniani Piemonte", which collaborated with the regional section of the Italian Association of Parkinsonian patients "Gianni Cavallari", and in particular to their president, U. Pilotto.

References

[1] S.M. Papa, P. Brundin, V.S. C Fung, U.J. Kang, D.J. Burn, C. Colosimo, H. Chang, R. N. Alcalay, C. Trenkwalder, MDS-scientific issues committee, impact of the COVID-19 pandemic on Parkinson's disease and movement disorders, Mov. Disord. 35 (2020) 711-715, https://doi.org/10.1002/mds.28067.

[2] Y.C. Li, W.Z. Bai, T. Hashikawa, The neuroinvasive potential of SARS-CoV2 may play a role in the respiratory failure of COVID-19 patients, J. Med. Virol. (2020), https://doi.org/10.1002/jmv.25728 [Epub ahead of print].

[3] A. Antonini A, V. Leta, J. Teo, K.R. Chaudhuri, Outcome of Parkinson's disease patients affected by COVID-19, Mov. Disord. (2020), https://doi.org/10.1002/mds.28104 [Epub ahead of print].

[4] R. Cilia, S. Bonvegna, G. Straccia, G. Andreasi Nico, A.E. Elia, L.M. Romito, G. Devigili, E. Cereda, R. Eleopra, Effects of COVID-19 on Parkinson's disease clinical features: a community-based case-control study, Mov. Disord. (2020), https://doi.org/10.1002/mds.28170 [Epub ahead of print].

[5] A. Fasano, E. Cereda, M. Barichella, E. Cassani, V. Ferri, A. L Zecchinelli, G. Pezzoli, COVID-19 in Parkinson's disease patients living in Lombardy, Italy, Mov. Disord. (2020), https://doi.org/10.1002/mds.28176 [Epub ahead of print].

[6] E. Hainque, D. Grabli, Rapid worsening in Parkinson's disease may hide COVID-19 infection, Park. Relat. Disord. (20) (2020) S1353–S8020, https://doi.org/10.1016/j.parkreldis.2020.05.008, 30117-6.

Carlo Alberto Artusi[a,*], Alberto Romagnolo[a], Gabriele Imbalzano[a], Alberto Marchet[b], Maurizio Zibetti[a], Mario Giorgio Rizzone[a], Leonardo Lopiano[a]

[a] *Department of Neuroscience "Rita Levi Montalcini", University of Torino, Torino, Italy*

[b] *Martini Hospital, Torino, Italy*

[*] Corresponding author. Department of Neuroscience "Rita Levi Montalcini", University of Torino, Via Cherasco 15, 10126, Torino, Italy.

E-mail address: caartusi@gmail.com (C.A. Artusi).