# Seroprevalence of SARS-CoV-2 in Parkinson's Disease Patients: A Case–Control Study

A novel coronavirus, the so-called "Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)," caused the ongoing pandemic, which was initially identified in Wuhan, China.[1] Undefined rates of asymptomatic infections have raised concerns about a possibly high frequency of undiagnosed infections of SARS-CoV-2.[2]

The impact of the COVID-19 pandemic on patients with Parkinson's disease (PD) is yet to be determined.[3] Studies showed diverse prevalence and outcomes among PD patients.[4,5]

Assessing a precise approximation of the prevalence of COVID-19 necessitates testing antibodies in people who are not symptomatic.[6] Therefore, the aim of this study is to evaluate the seroprevalence of SARS-CoV-2 among PD patients who did not have the symptomatic infection.

The Iran National Committee for Ethics in Biomedical Researches approved this cross-sectional, case–control study (IR.SBMU.RETECH.REC.1399.1228) [Correction added on

**TABLE 1.** Characteristics of PD patients and control group

| | PD patients | PD patients mean IgG ± SD | Healthy controls | Controls mean IgG ± SD | IgG ratio comparison |
|---|---|---|---|---|---|
| Patients, n | 90 | 5.15 ± 5.21 | 97 | 4.97 ± 4.44 | $P \approx 0.00086$ |
| Men, n (%) | 66(73.33) | 1.56 ± 3.14 | 48(49.5) | 0.91 ± 2.58 | $P \approx 0.003$ |
| Women, n (%) | 24(26.67) | 1.45 ± 3.96 | 49(50.5) | 0.71 ± 1.71 | $P \approx 0.19$ |
| Mean age, years ± SD | 57.68 ± 13.99 | | 58.97 ± 19.65 | | |
| **Age classification, n (%)** | | | | | $P > 0.05$[a] |
| <50 years | 26(28.88) | 1.34 ± 3.74 | 35(36.08) | 0.67 ± 1.94 | |
| 50–70 years | 46(51.11) | 1.74 ± 3.48 | 31(31.95) | 0.87 ± 2.79 | |
| >70 years | 18(20) | 1.28 ± 2.46 | 31(31.95) | 0.89 ± 1.74 | |
| **Mean disease duration, n (%)** | | | | | $P > 0.05$[a] |
| <3 years | 27(30) | 1.82 ± 4.02 | | | |
| 3–10 years | 34(37.77) | 1.41 ± 2.47 | | | |
| >10 years | 29(32.22) | 1.41 ± 3.68 | | | |
| **Underlying disease, n (%)** | | | | | $P \approx 0.18$ |
| Hypertension | 20(22.22) | 1.55 ± 2.58 | 51(52.57) | 0.93 ± 2.06 | |
| **Medication, n (%)** | | | | | $P > 0.05$ |
| Amantadine | 25(27.77) | 1.99 ± 4.55 | | | |
| Levodopa | 80(88.88) | 1.28 ± 2.83 | | | $P > 0.05$ |
| Direct contact with Covid-19-confirmed patients, n (%) | 24(26.66) | 0.97 ± 1.67 | 11(11.34) | 0.37 ± 0.32 | $P \approx 0.78$ |
| No direct contact with Covid-19-confirmed patients, n (%) | 66(73.33) | 1.74 ± 3.78 | 86(88.65) | 0.86 ± 2.30 | $P < 0.00001$ |
| No direct contact with Covid-19-confirmed patients and positive IgG test, n (%) | 19(28.7) | 5.30 ± 5.72 | 11(12.7) | 5.30 ± 4.50 | $P \approx 0.067$ (proportion comparison) $P \approx 0.91$ (positive IgG comparison) |
| **Duration of contact, n (%)** | | | | | $P > 0.05$[a] |
| <1 week | 6(25) | 1.64 ± 2.45 | 6(54.55) | 0.44 ± 0.42 | |
| 1 week | 5(20.83) | 0.89 ± 1.46 | 0(0) | | |
| >1 week | 13(54.16) | 0.69 ± 1.35 | 5(45.45) | 0.28 ± 0.13 | |

[a]Comparison between PD and control subgroups. IgG: negative, <0.9; borderline, 0.9–1.1; and positive, >1.1.
PD, Parkinson's disease; SD, standard deviation.



**Key Words:** Parkinson's disease; SARS-CoV-2; seroprevalence

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7 June, 2021 after first online publication: In the preceding sentence, the approval number was updated.]. All PD patients who had visited Shohada-e-Tajrish University Hospital, a referral Movements Disorders center, in December 2020, when Iran had experienced the third wave of COVID-19 pandemic, were enrolled in the study. Patients who had the symptomatic infection with SARS-CoV-2 were excluded, and after signing the informed consent forms, patients completed a questionnaire that included demographics data; PD-related information; comorbid conditions; details regarding having had close contact with SARS-CoV-2-infected individuals; and symptoms such as anosmia, cough, coryza, fever, malaise, and musculoskeletal pain. A blood sample was taken to check IgG antibodies for SARS-CoV-2 IgG. Also, blood serum of healthy controls who did not have the symptomatic infection during the same time was checked for SARS-CoV-2 IgG.

All blood samples were tested using the enzyme-linked immunosorbent assay (ELISA) technique, using commercially accessible kits (SARS-CoV-2. IgG 96 Elisa Kit. Ideal, Tehran, Iran), with a sensitivity of 81.82% and a specificity of 94.83%.

A total of 90 subjects who were identified with PD and 97 healthy controls were included in the study. Table 1 presents the demographic, disease-associated, and COVID-19-related data. The difference in the proportion of variables is compared using Fisher's exact test, and the difference in mean IgG ratio in different groups is compared using the $z$ score and Mann-Whitney $U$ test depending on the distribution of data. About 25.56% of PD patients and 12.37% of controls tested positive for SARS-CoV-2 IgG antibody, and these proportions were significantly different ($P < 0.05$). The mean total IgG ratio was $1.53 \pm 3.36$ and $0.80 \pm 2.17$ in PD and control groups, respectively, and the difference was statistically significant ($P < 0.01$).

There was no statistical difference between the IgG ratio of PD patients and the control group who had direct contact with SARS-CoV-2-positive individuals ($P > 0.05$). Nevertheless, we found a statistically significant difference between the IgG ratio of PD patients and control group who had not direct contact with SARS-CoV-2-positive individuals ($P < 0.00001$). Moreover, the proportion of PD patients with positive IgG test who had no direct contact with Covid-19 patients was significantly higher than that of the same individuals in the control group ($P < 0.05$).

A study conducted in the United Kingdom supports our outcome[4]; nevertheless, another study conducted in Italy showed that PD patients do not pose a higher risk of SARS-CoV2 infection,[5] but this study evaluated patients based on having an asymptomatic infection.

Therefore, the result of the current study indicates that PD patients can be more susceptible to Covid-19 infection. But more studies with higher sample sizes should be performed to confirm these results.

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