

**How to Cite:**

Bakre, A., Wanjari, A., & Aradhey, P. R. (2022). Neurological complications in COVID 19: An analytical study. *International Journal of Health Sciences*, 6(S3), 2293–2300.  
<https://doi.org/10.53730/ijhs.v6nS3.6035>

## **Neurological complications in COVID 19: An analytical study**

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**Abstract**---Long term effects of COVID-19 are not known and more studies are needed to understand effects of COVID-19 on the brain, which have already been observed. An investigation on the incidence and relative risk of neurological and mental disorders after a COVID-19 diagnosis was part of this research. We used data from the electronic well-being records network in this review partner investigation. On or after June 1<sup>st</sup>, 2021, members of all partners experienced a list occasion and were still living on December 31<sup>st</sup>, 2021, disregarding maturation, at the end of the year. All patients who had a confirmed finding of COVID-19 were allocated in this study. Patients with flu and those with any respiratory illness, including flu, were included in the second group of controls. The neurological symptoms were accessed and quantified according to the two groups and then statistically analysed for the significance. It was calculated that 82% of the 200 people identified with COVID-19 got a neurological or psychiatric diagnosis during the next six months. COVID-19 participants were diagnosed with cerebral haemorrhage (8 %), ischemic stroke (7%), parkinsonism (15%), dementia (18 %), anxiety disorder (12%), and psychotic illness (11 %), among other conditions (11%). Our research shows a high level of neurological and psychological morbidity amongst those with COVID-19 and hence could be always told to the patient who has been affected by COVID 19.

**Keywords**---neurological complications, COVID 19, haemorrhage, ischemic stroke, parkinsonism, dementia, anxiety disorder, psychotic illness.

## **Introduction**

As of March 11, 2020, survivors of the COVID-19 pandemic may be at an elevated risk of neurological problems. This worry was first predicated on observations from other coronaviruses<sup>1</sup>, but was quickly followed by case series<sup>2, 3, 4</sup>, developing evidence of COVID-19 CNS involvement<sup>5, 6, 7</sup> and the discovery of mechanisms by which this may occur.<sup>8, 9, 10, 11</sup> Anxiety and depression among COVID-19<sup>12, 13</sup> survivors has been linked to an elevated risk during the first three months following infection, according to a number of studies.<sup>14-18</sup> For now, we can only speculate on the long-term impact of the COVID-19 epidemic on mental health. Having access to this data is essential for the creation of benefits and the selection of research topics. As part of our investigation, we used an electronic health records organization to look at the neurological and social effects on survivors six months after a clinical COVID-19 illness check, and we compared this risk to that of other health-related problems. These hazards may be affected by the severity of the COVID-19 illness, as shown by hospitalization, severe treatment unit (ITU) recognition, and encephalopathy. Furthermore, we and our colleagues analyzed a six-month trend in risk proportions.

## **Methods**

All patients who had a confirmed finding of COVID-19 were allocated in this study from Jawaharlal Nehru Medical College and Acharya Vinoba Bhave Rural Hospital, Wardha. Patients with flu and those with any respiratory illness, including flu, were included in the second group of controls. There were many known and suspected risk factors for COVID-19 and the more serious COVID-19 illness, such as age, gender identity and sexual orientation, race and ethnicity, body mass index (BMI), blood pressure, diabetes and kidney disease, as well as smoking, substance abuse, heart disease (including ischaemic heart disease) and various types of heart disease. We also looked at financial hardship, malignant growth (specifically hematological disease) and persistence. Results were analyzed to determine the neurological and mental effects of COVID-19, including intracranial drain, ischaemic stroke, Parkinson's illness and parkinsonism, Guillain-Barré condition, nerve, plexus, or axonal problems, myoneural intersection, and muscle illness (neuromuscular junction and muscle sickness).

Patients who had been diagnosed with a long-term illness (such as dementia or Parkinson's disease) were not allowed to participate in the assessment. Findings that are likely to be repeated or retracted (such as ischemic strokes or mental findings) were subjected to a first-pass analysis (i.e. excluding those who had an analysis prior to the file occasion) and the frequency of any conclusion were tallied up among these results (ie, including patients who had a determination eventually before the record occasion). We tried to estimate the prevalence of certain findings, such as Guillain-Barré condition. Overall risk of neurological and psychiatric consequences following COVID-19 was assessed by estimating the

incidence of any of these 14 outcomes, as well as first-time diagnoses for each outcome. Some patients had multiple diagnoses, which lowered the total incidence of each outcome by a smaller percentage than expected. After completing our research, we sought to determine if the severity of COVID-19 had any impact on the patients' neurological and psychological symptoms. There were four separate subgroups of people with COVID-19 who were studied: those who had been hospitalized within a 4-day window before their diagnosis; those who had not been hospitalized; There were two groups: those who had been admitted to an intense treatment facility, and those who had not. Each of these four groups had its incidence of outcomes calculated.

For example, a subset of people may have different results based on their preexisting features. It was for this reason that an HR was determined between hospitalized (or ITU) patients and a matching cohort of patients who did not need hospitalization (or ITU) as well for those with encephalopathy and the unaffected control group (unaffected control). HRs were obtained from medical records for patients who had not been admitted to the hospital because of COVID-19, influenza, or another respiratory tract disease.

### Statistical analysis

It was determined that two cohorts were well matched when the standardised mean difference between them was less than one.<sup>19, 20</sup> It was decided to test the proportional hazard assumption by using the generalized Schoenfeld approach. It was used to analyze the time-varying HR when the assumption of log cumulative hazard (HR) was violated.<sup>21</sup> It was necessary to utilize a two-sided p-value of 0.05 to obtain statistical significance in this study. Funders had no say in the research design or in the collecting of the data or the interpretation of the results.

### Results

Table 1  
Demographic data

	All Patients
Cohort size	200(100·0%)
Demographics	
Age, years	44.1 years
Sex	
Male	104
Female	96
Other	0
Comorbidities	
Overweight and obesity	42
Hypertensive disease	44
Type 2 diabetes	36
Asthma	25
Nicotine dependence	17
Substance use disorder	24

Ischaemic heart diseases	21
Other forms of heart disease	4
Chronic kidney disease	15
Neoplasms	45

The primary cohort contained 200 COVID-19 patients, whereas the two propensity-score-matched control cohorts included 105 influenza patients and 236 other respiratory tract diseases. Many persons were not hospitalized; 46 were admitted to the hospital; 89 were admitted to the critical care unit; and a limited number of patients were diagnosed with encephalopathy while in the hospital.” An appendix including information on group demographics can be found in table 1. Propensity-score matching was excellent across all comparisons and baseline factors. This study looked at how many people in the primary cohort had neurological or mental symptoms six months after being told they had COVID-19.(table 2). According to the cohort subgroups, these estimates ranged from 38% to 73% for those who were hospitalized, 46% to 48% for those in ICU, and 63% for those diagnosed with encephalopathy. An even more notable increase in the number of individuals who received their first documented diagnosis of neurological or mental illness was noticed (table 2).

Table 2  
Neurological complications amongst all patients

All Patients	Group 1 (COVID 19)	Group 2 (Control Group)
Intracranial haemorrhage (any)	8 %	0.11 %
Ischaemic stroke(any)	7.1 %	1.2%
Parkinsonism	15.22 %	1 %
Dementia 0.63%	19.18 %	1 %
Anxiety 15.36% disorder(any)	11.82 %	9 %
Psychotic 2.20% disorder(any)	10.98 %	5 %
Others	11.02 %	5 %

Patients with COVID-19 had higher rates of cerebral hemorrhage and ischemic stroke than those with other respiratory tract infections. The HR dropped with time, but it remained significantly higher than 1, indicating that the risk for mental illness as a whole was lowered but maintained six months after the COVID-19 diagnosis.

Table 3  
HRs for the major outcomes in patients without hospitalisation after COVID-19 compared with those after influenza or other RTIs

COVID-19 vs influenza in patients without hospitalisation (N=200) vs other RTI in patients without hospitalisation (N=191)
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	HR (95%CI)	pvalue	HR (95%CI)	pvalue
Intracranialhaemorrhage(any)	1.82	0.0012	1.34	0.004
Ischaemicstroke(any)	1.77	<0.001	1.56	<0.001
Parkinsonism	2.11	0.018	1.16	0.52
Guillain-Barrésyndrome	0.87	0.89	1.39	0.20
Nerve,nerveroot,orplexusdisorders	1.56	<0.001	1.19	<0.001
Myoneuraljunctionormuscleddisease	3.23	<0.001	2.45	<0.001
Encephalitis	1.67	0.085	2.12	0.046
Dementia	1.67	0.005	1.89	<0.001
Mood,anxiety,orpsychoticdisorder(any)	1.55	<0.001	1.11	<0.001
Mooddisorder(any)	1.43	<0.001	1.22	<0.001
Anxietydisorder(any)	1.44	<0.001	1.11	<0.001
Psychoticdisorder(any)	1.89	<0.001	1.44	<0.001

There was an overall hazard ratio (HR) for patients with COVID-19 of 1.47 (95 percent confidence interval), for patients with influenza had HRs averaging 1.83 percent, whereas those with other respiratory tract illnesses had HRs averaging 1.28 percent. Patients with COVID-19 who required hospitalization were compared to those with the same condition who did not to determine the death rate. “Non-hospitalized patients were shown to be at greater risk for all outcomes compared to those who had been admitted to the hospital, with the exception of nerve, nerve root or plexus illnesses. When we compared individuals with COVID-19 who were diagnosed with encephalopathy during the acute illness to those who weren't, we found that HRs were significantly higher for those with encephalopathy (table 3).

We looked at additional variables that may have an impact on the results. Although COVID-19 was the primary cause of these hospitalizations, it is possible that they were caused by an early complication of COVID-19 rather than COVID-19 itself. These findings were consistent even after omitting results from the time period in question; nevertheless, several HRs had been decreased. The number of visits to the doctor by COVID-19 survivors was lower than that of the other cohorts, as well. As a result, the increased frequency of various diagnoses was not only attributable to the availability of new diagnostic options. Patients who had died before the analysis was completed were included in all three sensitivity analyses, and the rates of neurological and psychiatric sequelae were found to be higher in patients who had influenza in 2019 or 2018 than in those who had influenza in 2019 (appendix page 51). “The findings were also consistent when the COVID-19 diagnosis was confirmed by RNA or antigen testing (appendix page 52). (appendix pp 53).”

## Discussion

There have been several predictions and reports of negative neurological and psychological effects after the effect of COVID-19. “Various studies show that shows that patients who had COVID-19 were more likely to have these

consequences than individuals with other health issues that occurred at the same time as the COVID-19 pandemic.<sup>1, 2, 3, 4, 5, 14</sup>. The severity of COVID-19 was certainly a factor in later neurological diagnosis. All patients were at greater risk of developing neurological or psychiatric disorders, but the danger was greatest among those who required to be hospitalized to the ICU or had encephalopathy, despite excellent propensity score matching for other characteristics (eg, age or previous cerebrovascular disease). Infection of the central nervous system (CNS) by viruses, hypercoagulable states, and the neurological effects of the immune response are all possibilities.<sup>22</sup> There was a greater frequency and relative risk of neurological and mental illnesses in 9 patients with COVID-19 who were not hospitalized.

We should highlight a few distinct neurological diseases. As previously reported<sup>23,24</sup> the incidence of ischaemic stroke increased to around one in ten (or three out of 100 for a first stroke) in patients with encephalopathy after COVID-19, which is consistent with earlier findings. According to the studies, patients with COVID-19 were more likely to have a stroke than those with influenza.<sup>25</sup> There was tentative evidence in a prior research that COVID-19 and dementia were linked together.<sup>26</sup> This is corroborated by the study's findings. COVID-19's relationship with cerebrovascular and neurodegenerative illnesses is worrisome, and more information is needed regarding their severity and progression. "A similar ambiguity pervaded our data, with HRs rising with COVID-19 in comparison to other respiratory tract infections but not influenza. Concerns have been raised about post-COVID-19 parkinsonian diseases after the 1918 influenza pandemic, which was brought on by an epidemic of encephalitis lethargica.<sup>27</sup> Nonetheless, we were able to find some support for this notion, although the incidence was low and not all HRs were statistically significant in our investigation. A longer follow-up may offer a more conclusive indication whether Parkinsonism is a delayed effect.

This study also indicated a greater prevalence of psychotic diseases than the previous one. Because of the larger sample size and extended length of follow-up, this is most likely the case in our study. More COVID-19 patients than influenza or other respiratory tract disease patients had drug use issues and insomnia, according to study results (except for the incidence of a first diagnosis of substance use disorder after COVID-19 compared with other respiratory tract infections)." Like the neurological impacts, COVID-19's psychological consequences seem to be long-lasting.<sup>28,29</sup> The dangers linked with COVID-19 remained at the 6-month time period since the HRs for most neurological outcomes remained unchanged. Research over a longer time period is required to determine how long a person is at risk and how their diagnoses progress.

A large sample, matching using propensity scores, and the results of sensitivity and additional analyses support our findings. When it comes to encephalopathy research, a word of warning is in order (delirium and associated diseases). This diagnosis was given to many patients who were admitted to the hospital, although only around 11% of those patients got it. "Patients with COVID-19 who experience delirium should not be generalized to all COVID-19 patients who experience delirium owing to the known under-recording of delirium during acute illness."<sup>30</sup>

## Conclusion

There was an increase in neurological and psychiatric diagnoses in individuals who had received therapy in the six months after COVID-19. It is essential that services be set up and resources allocated in advance of this upcoming demand.

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