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Original Research Article

MRI evaluation of Brain in post covid survivors to study the neuropsychiatric symptoms associated with Covid-19

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Abstract:

Background & Method: The aim of the study is to study MRI evaluation of Brain in post covid survivors to study the neuropsychiatric symptoms associated with Covid-19.

Result: In our study we found, 61.6% male and 38.4% female. In our study we found 35% maximum in age group of 46-60. The chi-square statistic is 1.993. The p-value is .018031. The result is significant at $p < .05$. The chi-square statistic is 0.0173. The *p*-value is .048308. The result is significant at $p < .05$.

Conclusion: Neurological and neuropsychiatric symptoms are common in COVID-19 patients. Emerging neuroimaging and neurochemical evidence indicate neuroimmune dysfunction and brain injury in severe COVID-19 patients, especially those with neuropsychiatric manifestations. These neuropsychiatric complications are recognized as critical contributors to morbidity and mortality during the COVID-19 pandemic and have become major public health challenges. SARS-CoV-2 infection can directly invade the CNS through the blood circulation and neuronal pathways, and indirectly affect the innate and adaptive immune system and cause neuroinflammation. Both of these disruptions to immune functioning and neuroinflammation ultimately lead to brain lesions and accelerate the progression and worsening of the clinical outcomes of neuropsychiatric disorders.

Keywords: MRI, brain, covid & neuropsychiatric.

Study Designed: Observational Study.

1. Introduction

The typical presentation of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV- 2) includes fever and respiratory difficulties. However, studies have shown that COVID-19 has a multi-organ pathology[1]. Recent studies have reported that more than one-third of the infected patients develop neurological symptoms in the acute phase of the disease, and that 34% show brain abnormalities such as white matter hyperintensities and hypodensities as well as microhemorrhages, hemorrhages, and infarcts[2]. Intriguingly, several studies have reported a high incidence of acute psychiatric symptoms in COVID-19 patients. It has been suggested that at least 35% of the patients display symptoms of anxiety and depression[3].

Early in the COVID-19 pandemic, neuropsychiatric symptoms were identified as a prominent feature of coronavirus outbreaks. Analyses subsequently confirmed many neuropsychiatric manifestations of acute infection with severeacute respiratory syndrome coronavirus 2 (SARS-CoV-2), with non-specific symptoms such as fatigue and headache, the most commonly studied and reported in the early literature. Studies assessing the prevalence of depression, anxiety and post-traumatic stress in acute COVID-19 suggested specific

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psychiatric morbidity. The degree of persistence of neuropsychiatric symptoms in the post-acute and chronic phases after infection, however, remained far from clear[4].
Persistent symptoms after COVID-19 illness have been called 'Long COVID'. The point of onset of Long COVID is imprecisely defined and has been proposed to range from 3 to 12 weeks after infection. Separately, However it is defined, persistent symptoms after COVID-1 are considered to be multisystem in nature with most likely several distinct pathological mechanisms[5]. These uncertainties of definitions, terminology and mechanism reflect the early stage of our knowledge about persisting symptoms after COVID-19, and in particular the lack of systematized descriptions of different components of the syndrome.
Brain changes have been reported in the first weeks after SARS-CoV-2 infection. However, limited literature exists about brain alterations in post-COVID syndrome, a condition increasingly associated with cognitive impairment. The present study aimed to evaluate brain functional and structural alterations in patients with post-COVID syndrome, and assess whether these brain alterations were related to cognitive dysfunction[6].
Many severe COVID-19 patients who are admitted to an ICU risk infection spread when transported to imaging suites. In response to this risk, clinicians should consider a recently developed novel portable, low-field magnetic resonance imaging (MRI) device to evaluate neurological injury such as stroke and hemorrhage at the bedside of critically ill ICU patients. Brain MRI examinations revealed uncommon but important findings of disseminated leukoencephalopathy in COVID-19 patients with neurologic symptoms. Brain computed tomography (CT) scan in a patient with SARS-CoV-2 infection revealed a massive intracerebral hemorrhage in the right hemisphere, accompanied by intraventricular and subarachnoid hemorrhage. Brain [18F]fluoro-2- deoxy-D-glucose-positron emission tomography/CT imaging in four cases of COVID-19-related encephalopathy showed consistent frontal hypometabolism and cerebellar hypermetabolism[7]. An MRI-based 3-month follow-up study showed that 55% of COVID-19 patients who presented with neurological symptoms had microstructural and functional brain integrity disruption during this recovery stage. Besides ischemic infarction, signal abnormalities in the medial temporal lobe, non-confluent multifocal white matter hyperintense lesions, and extensive and isolated white matter microhemorrhages are frequently found in severe COVID-19 patients with neurological symptoms. A COVID-19 patient presenting with altered mental status showed acute necrotizing encephalopathy on CT and MRI[8].
Early postmortem brain MRI in COVID-19 non-survivors have demonstrated white matter changes, brain hemorrhages, and encephalopathy without brainstem changes, which all may result from BBB impairment. Neuropathology in 18 COVID-19 nonsurvivors uncovered acute hypoxic injury in the cerebrum and cerebellum, with neuronal loss in the cerebral cortex, hippocampus, and cerebellar Purkinje cell layer, but no encephalitis. Coronial autopsies of two fatal COVID-19 patients showed cerebral cortical infarction and brainstem encephalitis, but found no SARSCoV- 2 RNA in these postmortem brain tissues using RNAscope in situ hybridization and reverse transcription-polymerase chain reaction (RT-PCR). These neuropathological findings may be related to hyperinflammatory and hypercoagulable status induced by SARS-CoV-2 infection[9].

2. Material & Method

Present study was conducted at RD Gardi Medical College, Ujjain in Radio diagnosis for 01 Year. We defined the 'persistence' of symptoms differently for hospitalized and community-based samples. In hospitalized samples, we considered persistent symptoms as those present

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after hospital discharge, because discharged individuals are generally beyond the acute illness phase. In community-based samples, which lacked a discharge date, we considered persistent symptoms as those still present at least 4 weeks after the onset of symptoms or a positive PCR test.

We adopted a definition of 'neuropsychiatric' symptoms proposed by patient-led research in this area. We studied: affective symptoms (specifically anxiety and panic attacks, depression and mania); hallucinations; sleep disturbance; objectively reported cognitive impairment (i.e. through standardized cognitive tests); subjective cognitive impairment.

We adapted a previously published, persisting or Long COVID. To maximize sensitivity, our search strategy did not specify neuropsychiatric terms. We further examined our weekly curated database of COVID-19 neurology and neuropsychiatry research.

Inclusion Criteria:

We included any observational study reporting persistent neuropsychiatric symptoms in adults (aged 18+ years), with a history of polymerase chain reaction (PCR)-confirmed or clinically suspected SARS-CoV-2 infection.

Exclusion Criteria:

1. MRI contraindicated implants and devices
2. Critically ill patients
3. <14years of age(paediatric patients)

3. Results

Table 01: Age Distribution

S. No.	Age Group	No.	Percentage	P Value
1	18-30	08	13.3	.018031
2	31-45	14	23.3	
3	46-60	21	35	
4	61-75	17	28.4	

In our study we found 35% maximum in age group of 46-60. The chi-square statistic is 1.993. The p-value is .018031. The result is significant at $p < .05$.

Table 02: Gender Distribution

S. No.	Gender	No.	Percentage
1	Male	37	61.6
2	Female	23	38.4

In our study we found, 61.6% male and 38.4% female.

Table 03: Findings

S. No.	Findings	No.	Percentage	P Value
1	Cortical/ Sub cortical white matter hyper intensities on T2/ Flair	11	18.3	.048308
2	Subarachnoid Hemorrhage	23	38.3	
3	Cavernous Sinus	16	26.6	

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	Thromobisis			
4	Micro Hemorrhage	10	16.8	

The chi-square statistic is 0.0173. The *p*-value is .048308. The result is significant at $p < .05$.

4. Discussion

In this deliberate survey and meta-examination, we observed that neuropsychiatric side effects are normal and persevering after Coronavirus. Rest problems and weariness seem, by all accounts, to be particularly predominant and might be capable by upwards of one out of four patients[10]. Tension and post-horrendous pressure side effects additionally appear to be especially normal, and mental weakness is frequently impartially perceptible. Sensorimotor aggravations and dazedness or dizziness are more uncommon yet present in a non-unimportant extent of patients. The pervasiveness of these side effects seems, by all accounts, to be somewhat steady across various focuses in the initial a half year, among hospitalized and local area tests and among hospitalized patients paying little heed to Coronavirus seriousness. There are information holes in the neuropsychiatric outcomes of Coronavirus in patients who didn't need emergency clinic confirmation, the effect of nationality and the course and recurrence of side effects in the more extended term[11].

These discoveries ought to be deciphered mindfully. Three out of five examinations in this survey revealed side effects inside the Pleasant rule proposed edge of 12 weeks for the post-intense phase.9 Moderately barely any qualified local area based or ICU-conceded tests announced our results of interest, making adjusted decisions about the effect of Coronavirus seriousness challenging to draw[12]. In the event that, at the appointed time, huge suggestive contrasts rise up out of information looking at hospitalized and non-hospitalized patients, then, at that point, there could be a case that the term 'Long Coronavirus' is best held for patients who were not hospitalized — or that a subspecifier could be helpful to signify the seriousness of starting respiratory as well as different side effects. Non-hospitalized patients were in the minority in this audit (with just 15.7% affirmed thusly), mirroring the early exploration center around hospitalized patients. Notwithstanding, non-hospitalized patients were the greater part (91.6%) in a new enormous patient-drove review. In our view, patient points of view on phrasing for this at first persistent driven issue ought to be thought about similarly close by those of clinicians and scientists[13].

It has become obvious that Covid infection 2019 (Coronavirus) has a multi-organ pathology that incorporates the mind and sensory system. A few examinations have likewise detailed intense mental side effects in Coronavirus patients. A rising number of studies are proposing that mental shortages might continue after recuperation from the essential contamination. In the ongoing efficient survey, we give an outline of the accessible proof and supply data on potential gamble factors and hidden organic components behind such mental sequelae. Remembered essential examinations generally contained data for the subsequent period and gave quantitative proportions of psychological well-being[14]. The inquiry was performed on June fourth 2021. 1725 one of a kind investigations were recognized. Of these, 66 met the consideration standards and were incorporated. Time to follow-up went from following clinic release as long as 7 months after release, and the quantity of members traversed 3 to 266,586 members. Forty examinations revealed nervousness and additionally sorrow, 20 investigations detailed side effects or determinations of post-horrible pressure problem (PTSD), 27 investigations announced mental shortages, 32 articles tracked down weakness at

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follow-up, and rest aggravations were tracked down in 23 examinations. Featured risk factors were infection seriousness, span of side effects, and female sex. One review showed cerebrum irregularities corresponding with mental deficiencies, and a few examinations revealed fiery markers to connect with side effects. By and large, the outcomes from this survey propose that overcomers of Coronavirus are in danger of mental sequelae however that side effects for the most part work on after some time[15].

Neurological and psychiatric complications of COVID-19 are increasingly reported, but most are individual cases or case series. Headache, anosmia, and myalgia are most commonly reported in patients infected with SARS-CoV-2. SARS-CoV-2 infection can attack the CNS and induce spine demyelinating lesions, which could further lead to neuropsychiatric symptoms affecting cognitive, affective, behavioral, and perceptual domains. These neuropsychiatric symptoms, including cerebrovascular, psychiatric, and neuromuscular disorders, frequently occur in elderly patients and individuals with multiple comorbidities or severe infection. Both SARS and MERS are associated with delirium, depression, anxiety, memory impairment, and insomnia during the acute phase[16]. Depression, insomnia, anxiety, memory impairment, and sleep disorders are frequently reported during the post-illness phase. A significant proportion of patients with COVID-19 develop delirium, agitation, altered consciousness, and other neuropsychiatric symptoms, including encephalopathy, encephalitis, depression, anxiety, and post-traumatic stress disorder.

A UK-wide surveillance study of acute neurological and psychiatric complications in 153 COVID-19 patients demonstrated that cerebrovascular events (62%) and altered mental status (31%, including encephalopathy, encephalitis, and psychiatric disorders, were reported, often occurring in younger patients. An observational series of 58 COVID-19 patients in Strasbourg, France reported encephalopathy, prominent agitation and confusion, corticospinal tract signs, and acute ischemic strokes. A tertiary-care hospital at Karachi, Pakistan reported on 350 patients with COVID-19 describing headache (6%), vertigo (3.4%), numbness/paresthesia (3.1%), impaired consciousness (2%), hyposmia/anosmia (1.4%), and encephalitis (0.9%). A retrospective, observational case series of 214 patients in Wuhan, China found that 78 patients (36.4%) had neurologic manifestations, including acute cerebrovascular diseases, impaired consciousness, and skeletal muscle injury. Analysis of data from 86 critically ill COVID-19 patients at the intensive care unit (ICU) of Tongji Hospital, Wuhan, China showed that 26 patients (30.2%) presented with neurological symptoms including delirium, stroke, cerebrovascular, and neuromuscular diseases. A retrospective multicenter cohort study of 917 patients in three regions in China demonstrated that new-onset critical neurologic events, mainly impaired consciousness and stroke, occurred in 3.5% of the total population and in 9.4% of severe or critical patients. A prospective multicenter observational study in New York City showed that 13.5% (606/4491) hospitalized COVID-19 patients developed a new neurological disorder including encephalopathy (309/606, 51%), strokes (84/606, 14%), seizures (74/606, 12%), and hypoxic/ischemic brain injury (65/606, 11%), and these disorders led to higher rates of in-hospital mortality and lower rates of discharge home. A survey of physician-reported neurological symptoms in COVID-19 patients from Italy showed that 87.3% of practitioners reported neurological symptoms, mainly mild and nonspecific manifestations such as headache, myalgia, and loss of smell.

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5. Conclusion

Neuropsychiatric symptoms are common in COVID-19 patients. Emerging neuroimaging and neurochemical evidence indicate neuroimmune dysfunction and brain injury in severe COVID-19 patients, especially those with neuropsychiatric manifestations. These neuropsychiatric complications are recognized as critical contributors to morbidity and mortality during the COVID-19 pandemic and have become major public health challenges. Both of these disruptions to immune functioning and neuroinflammation ultimately lead to brain lesions and accelerate the progression and worsening of the clinical outcomes of neuropsychiatric disorders.

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