ASSESSMENT OF COGNITIVE FUNCTIONS IN COVID- 19 RECOVERED PATIENTS

Dr. MEKALA BHARGAVA SWARAJ

Dissertation submitted to

BLDE (Deemed to be University) Vijayapur, Karnataka

In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE

IN

PSYCHIATRY

Under the guidance of

Dr.SANTOSH. RAMDURG

PROFESSOR

DEPARTMENTOF PSYCHIATRY

BLDE (Deemed to be University)

SHRIB.M.PATILMEDICALCOLLEGE

HOSPITAL & RESEARCH CENTRE, VIJAYAPUR

KARNATAKA

2020

"ASSESSMENT OF COGNITIVE FUNCTIONS IN COVID-19 RECOVERED PATIENTS"

DOCTOR OF MEDICINE

IN

PSYCHIATRY

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

S.NO.	ABBREVATION	FULL FORM
1.	SARS COV 2	SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2
2.	COVID 19	CORONAVIRUS DISEASE
3.	URTI	UPPER RESPIRATORY TRACT INFECTION
4.	CDC	CENTERS OF DISEASE CONTROL
5.	SARS MERS COV	SEVERE ACUTE RESPIRATORY SYNDROME MIDDLE EAST RESPIRATORY SYNDROME CORONAVIRUS
6.	ACE 2	ANGIOTENSIN CONVERTING ENZYME 2
7.	HR1 HR 2	
8.	RT PCR	REVERSE TRANSCRIPTASE POLYMERASE CHAIN REACTION
9.	ELISA	ENZYME LINKED IMMUNOSORBANT ASSAY
10.	CVD	CEREBROVASCULAR DISEASE
11.	GI	GASTROINTESTINAL
12.	BBB	BLOOD BRAIN BARRIER
13.	IL-8	INTERLEUKIN 8
14.	TNF	TUMOR NECROSING FACTOR
15.	CNS	CENTRAL NERVOUS SYSTEM
16.	GCSF	GRANULOCYTE COLONY STIMULATING FACTOR
17.	NLRP3	NUCLEOTIDE LIKE RECEPTOR PROTIEN 3
18.	TMT	TRAIL MAKING TEST

19.	PGI MEMORY SCALE (PGIMS)	POST GRADUATE INSTITUTE MEMORY SCALE
20.	DSST	DIGITAL SYMBOL SUBSTITUTION TEST
21.	MMSE	MINIMENTAL STATE EXAMINATION
23.	PMT	PROTEUS MAZE TEST
24.	WAIS	WECHSLER ADULT INTELLIGENCE SCALE

ABSTRACT

BACKGROUND: The SARSCOV-2 is known to cause Microvascular and Macrovascular thrombotic phenomena in the vascular system, which has been found to increase the chances of blood clotting in the brain. Microvascular subclinical thrombotic phenomena that lead to impairment in cognitive functions have not been studied much in this pandemic. So this is the first kind of study. The study aims to determine whether this SARS CoV-2 produces cognitive impairment in the person who has suffered from COVID-19. If it produces cognitive impairment, then whether it persists even after one month or not or whether it resolves.

MATERIALS AND METHODS: This longitudinal prospective study was carried out after taking institutional Ethical committee clearance. People in the age group of 18 to 60 years who were diagnosed as COVID-19 Positive, and got recovered and discharged, were assessed at the time of discharge, after one month and after three months using cognitive assessment battery (PGI MEMORY SCALE, DSST, TMT, ADULT PROTEUS and MMSE).

RESULTS: A total of 205 subjects were included in the study.71% are males, and 28.3% are females. The majority that is 36% of the study population, is between 40-49 years. Parameters like TMT and PGI MEMORY have been statistically significant between discharge day, after one month, and three months follow-up. The age group of 40 to 48 years was most affected, with a frequency of 75%.

CONCLUSIONS: The study has shown that cognitive impairment can happen after COVID 19 disease.

KEYWORDS: Cognitive assessment, COVID-19,Microvascular thrombotic phenomena.

INTRODUCTION:

In December 2019, Novel Coronavirus 2, also known as Severe acute respiratory syndrome coronavirus-2 (SARS-COV-2), surfaced in the city of Wuhan, Hubei province in China[1] The infection caused by this virus is named Coronavirusdisease 2019(COVID-19) by WORLD HEALTH ORGANISATION(WHO)[2]

SARS COV -2 has a single-stranded RNA genome with 32 kilobases in length, considered the largest RNA virus genome. The frequency of recombination of RNA-positive strands is high.

If the host gets infected with multiple coronavirus strains, viral recombination occurs, creating problems in diagnosing the disease and vaccine production.

The transmission of the virus from person to person occurs via droplets[3] The manifestations of COVID -19 range from asymptomatic or mild or moderate to severe symptoms and even death. The symptoms include high-grade Fever, Flu-like symptoms like cold, cough, sore throat and shortness of breath[4]. Other symptoms are fatigue or 15eneralized weakness, malaise, respiratory distress, myalgia, loss of taste (Ageusia) and loss of smell (Anosmia). Some people may have severe symptoms like pneumonia and acute respiratory distress[5].

People with underlying comorbid conditions like hypertension, heart disease, chronic lung disease and Diabetes may show more severe symptoms[6]

AIM:

- To assess the cognitive functions in COVID-19 recovered patients

OBJECTIVE OF THE STUDY:

- To assess the cognitive functions in COVID-19 recovered patients.
- To see the delayed effect of the coronavirus on cognitive functions.
- To assess the progress of the cognitive changes over three months.

REVIEW OF LITERATURE:

Towards the end of 2019, cases of an unidentified Upper Respiratory Tract infection(URTI) began to appear in Wuhan, Hubei Province, China[7] Because medical professionals had no solutions or explanations for the illness's transmission or pathogenesis, it quickly spread throughout the city and, subsequently, the entire country. By the first half of January 2020, it was thought that the infectious disease was possibly caused by a novel coronavirus widely known as SARSCORONA VIRUS(severe acute respiratory syndrome coronavirus2; the condition was termed COVID-19 DISEASE (coronavirus disease 2019)[8 9].

The virus quickly spread throughout the world, prompting the World Health Organization (WHO) to declare it a pandemic in early March 2020[10]. Lockdowns, constraints on travel, public transit, and meetings, as well as the closure of schools and businesses, were implemented to slow the spread[11]. All of these factors have hampered financial confidence, raising fears of a global recession.

HISTORY:

Humans have been recently infected by corona viruses, in contrast to viruses such as influenza, smallpox, and polio. When these viruses were discovered in the 1960s, there was little or nill pathogenic, epidemiological, or genetic information was available. All that was known was that they typically contain RNA encased in a membrane made up of spike-shaped protein structures [12].

The virus family was given the name after the crown-like appearances because of these surface spike molecules of protein ('corona' is the Latin word for crown)[13]. Viruses with that structural features are members of the Coronaviridae family, divided into four phylogenetic genera Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus [14 15]

The Centers for Disease Control and Prevention (CDC) in the United States has now identified seven coronavirus strains that can infect humans. In general, they are single-stranded,

positive-sense RNA genome-bearing viruses. Their genome is estimated to be between 26 and 32 kilobases long (the human genome is 3 billion kilobases long) [16 17].

The very first coronaviruses discovered in humans were human CoV-229E and HCoV-OC43 [18]. These viruses have been found to cause common URTIs like the common cold, and the infections they cause are mild. HCoV-HKU1 and HCoV-NL63, were discovered,after the discovery of first two strains[19].

Other coronavirus strains found in humans include SARS-CORONAVIRUS, MERS-CORONAVIRUS, and SARS- CORONAVIRUS 2[16]. The above viral strains differ from the primary viral strains in that they end up causing potentially fatal infections and diseases. The extremely low R0 of HCoV-C43, HCoV-229E, HCoV-NL63, and HCoV-HKU1 distinguishes them from the serious coronavirus strains[20]. The basic replication number explains a pathogen's transmissibility or contagiousness[21]. Interventions like maintaining 2m distance and immunisation can impact the value, which is not fixed. R0 denotes the number of people who can be exposed to the virus by a single infected individual[22].

Greater the R0 value,higher the probability to spread the infection. Organisms with R0 values greater than one are thus regarded as highly infectious. In contrast, organisms with low R0 values can be contained without isolating known cases and potentially contaminating people[23]. Even though these viruses have been present among humans for more than 60 years, they have only recently been at the forefront of research and media attention as a result of the SARS-CoV outbreak[15], which previously was founded in the early 20th century that this microorganism could cause a worldwide spread[24]. The most common 4 non-severe coronaviruses which can infect are found worldwide, though in lower concentrations in any given local population[15]. In accordance with the three severe coronavirus strains, SARS-CoV infections were concentrated in China, with relatively small epidemics in other countries. Since 2012, Middle East Respiratory Corona Virus are being reported, with most cases occurring in the Middle East.

The pathogen that causes COVID-19 DISEASE, SARSCORONA Virus, is a pandemic. SARS-CoV and MERS-CoV have been extensively studied and do not show any symptoms.

SARS -COV:

In November 2002, the SARSCORONA VIRUS first appeared in Guangdong Province, China. The strain is to blame for the SARS virus. Fever, fatigue, cough, and chills are all symptoms of an infection[25]. Many cases also experienced breathing difficulties and developed pneumonia[25]. Several people died from respiratory distress and lung failure[26]. Various factors, including pre-existing comorbidities and age, influenced patient outcomes. The SARSCORONA VIRUS incubation period was discovered to be 2-10 days[26]. It binds to the respiratory epithelial cells, causing major organ damage, primarily in the alveoli[27]. The virus is believed to originate in palm civet cats, implying a zoonotic spread to humans[28].

MERS-COV:

In September 2012, a Betacoronavirus from Saudi Arabia became the 2nd infectious agent in the human species[30 31]. With a mortality rate of 32-33%, this betacoronavirus strain is currently the most lethal[15]. MERS caused by this virus, MERS-CoV, has been reported in 27 countries, with Saudi Arabia accounting for 80% of these cases. There had been 2519 MERS cases as of January 2020, with 866 deaths[32]. MERS is believed to have begun in camels(dromedry) and infected to people through a zoonotic transmission[33]. In MERS, the time period between exposure and the appearance of the first symptom lasts about 5- 6 days, but symptoms can last anywhere ranging from two to fourteen days[34]. Symptoms include high grade fever, coughing, and breathing difficulties, in the most severe cases of viral infections.

SARS-COV 2:

On December 31, 2019, the WHO received the first report on COVID-19 DISEASE in Wuhan, China. In March 2020, the virus was announced as a worldwide pandemic. By the month of April 2020, the virus had infected 214 countries and was expanding rapidly (Fig. 1)[36 37]. As with MERS and SARS, patients prognosis are influenced by variables like pre-existing comorbid conditions . According to Chinese officials, individuals over 80 have the highest mortality rate [38].COVID-19 DISEASE has an incubation period of 14 days; throughout this time, the virus may infect others[38]. The virus can cause similar symptoms as that of MERS. And SARS, including symptoms such as fever, coughing, and breathing difficulties[38 39] . The basic reproduction number is 3 and 0.45 for SARS and MERS, respectively, and early COVID-19 DISEASE figures ranged from 2.2 - 3.11 [31 40 41] COVID-19 DISEASE has the same R0 as that of SARS but has a greater viral replication in patients' noses and throats before the appearance of signs and symptoms, whereas SARS has a connection which is more directly linked to symptoms[41]. This implies that this disease can spread before the appearance of symptoms[42].

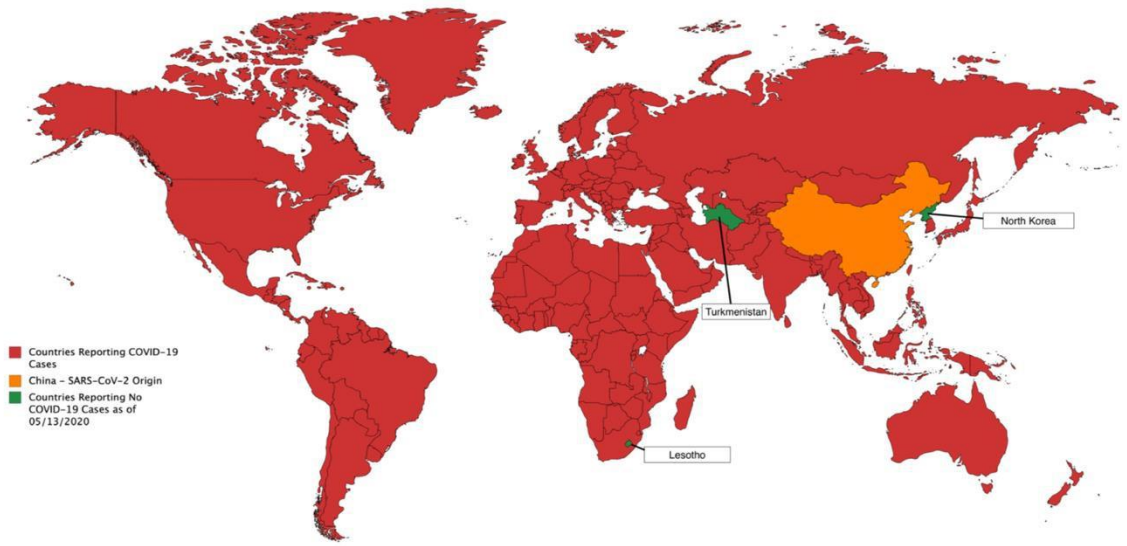


Fig. 1. Reported cases of COVID-19 by country adapted from CDC. Red represents China, the SARS-CoV-2 origin. Orange represents countries reporting COVID-19 cases. Green represents major countries reporting no cases of COVID-19 and includes Lesotho, North Korea, and Turkmenistan. Figure reproduced from [155].

EPIDEMIOLOGY OF SARS CORONA VIRUS:

In most(80%) cases, COVID-19 DISEASE symptoms include a low-grade fever, a dry cough, and difficulty breathing. In serious cases, 44% of patients experienced dyspnea (shortness of breath), 50% experienced hypoxia (oxygen depletion in body tissues), and 14% experienced a high fever [43 44 45 46.] Hospitalisation rates vary by age in the U.S. They tend to be from 0.1% in case of children aged (5-17) and 17.2% for people aged 85 and up, of these 5 percentage of cases which experienced severe conditions like septic shock and multiple organ dysfunction[43 44 45 46 47]

The two most important clinical symptoms that emerge in clinically ill COVID-19 DISEASE infected persons[48] are low oxygen levels due to ARDS and high fever[49]. This decrease in level of saturation of oxygen is treated with ventilator[50]. Furthermore, it is believed that later stages of COVID-19 DISEASE result in decreased oxygen saturation because of decreased lung compliance [50 51 52 53]. Those asymptomatic but infected with COVID-19 DISEASE can still spread the disease[54].

COVID-19 DISEASE has insisted intense precautionary measures be practised to reduce spreading and morbidity. This aims to 'flatten the curve' of the projected infection rate and prevent healthcare services from becoming overburdened with so many new cases at once. According to some models, social distancing (keeping a 2 m distance) would decrease the estimated infections by 78%[55 56]. Furthermore, the criticality of disease and onset of COVID-19 disease vary drastically with age, with the symptoms worsening along with increased age[57]. Those individuals whose age fall below 19 are at the least risk, with mortality rates ranging from 0% to 0.1%, while those between the ages of 75 and 84 face mortality rates varying from 4.3% to 10.5%. Those aged 85 and up are the most vulnerable, with mortality rates tending to range from 10.4 to 27.3%[57]. Diabetes, cardiovascular disease, and immune system suppression contribute to an increased mortality rate[58].

SARSCORONA Virus, like other coronaviruses, is a positive sense RNA virus with a single strand that binds to epithelial cells of lungs via spike proteins (Fig. two)[59]. Receptor binding region of virus, the receptor of ACE2 (Fig. 3), are identical to the virus[60]. These receptors serve as SARSCORONA VIRUSspike protein docking sites, permitting virus and cell membranes to merge (Fig. 3). Then the cells are controlled by the virus by incorporating its Ribosnucleic acid into the replication system of the cells and which allows the spread of virus. Thus virus can spread to the entire body, inducing immune system responses and infecting the individual[61 62]

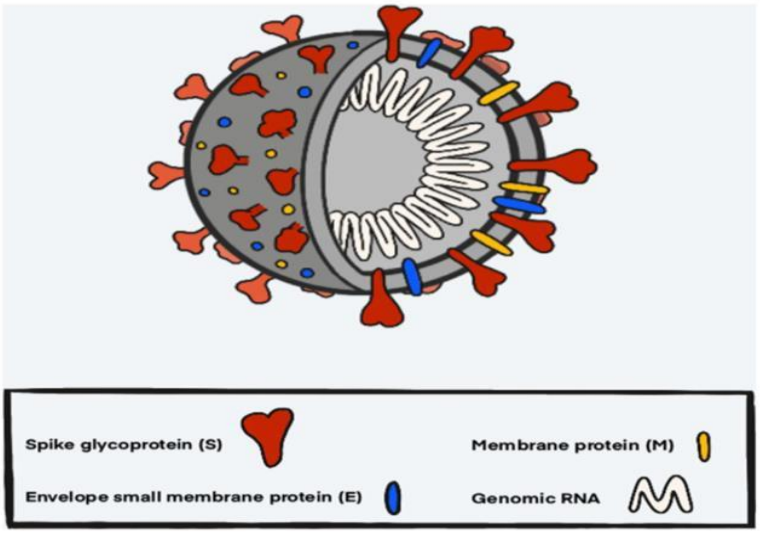


Figure 2 Diagram of SARS COV2 Virus

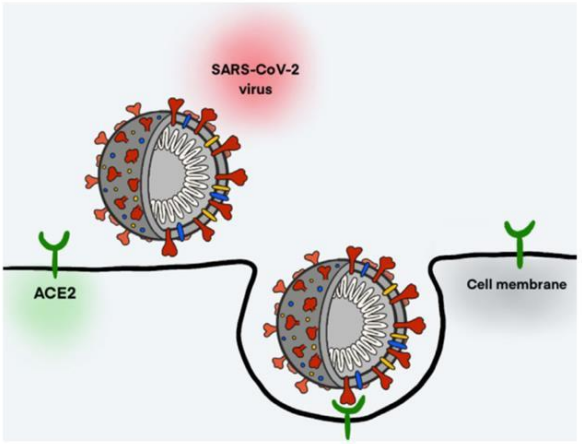


Figure 3 Diagram of SARS COV2 Virus Entry into host cell

Coronaviruses bind to host cell receptors via their homotrimeric spike glycoprotein (S protein) (Fig. 3)[63]. At the time of infection, the protein S is cleaved into S1 and S2 subunit. The first subunit(S1) consists of two RBD (receptor binding domain)which allows the virus to cling to the host cell, and the function of the second (S2) subunit is to merge the membrane[64].

ACE2 is the host cell receptor for S1 subunit of Protein S, an Integral polytopic protein found on epithelial cells of the heart, lungs and kidneys[65].Transformation is the main physiological

function of the angiotensin, which plays a role in blood pressure and constriction of vessels[66]. The ACE2's anti inflammatory expression safeguard against lung damage. In contrast, SARS-CoV or SARSCORONA VIRUS binding leads to increased pro-inflammatory markers that induce severe lung damage[67 68]. This receptor is significantly related to the transmissibility and infectivity of the SARSCORONA VIRUS, in addition to its potential role in COVID-19 pathology.

The SARS-CoV-2 RBD region has a 10-20-fold higher binding affinity to the ACE2 receptor due to differences in the sequence of amino acids allowing the more communications of protein S and the receptor of cell [69 70] Virus's capacity to bind for ACE 2 receptors on host cells also helps determines the transition of host organisms through which these can spread the disease before transmitting to humans, and thus how organisms can be studied[71 72]. When S1 subunit binds to the ACE2 receptor on target cell, then the S2 's heptad repeat 1 (HR1) and 2 (HR2) sites join together and form helix that which brings the virus and host cell walls together and gets merged[72 73]. When the membranes fuse, the coronavirus RNA enters the cell into the cytoplasm via initial endosome, where it get transcribed into a translation complex, which then converts subgenomic RNA to structural and accessory proteins (Fig. 3)[74 75 76]. These proteins bind together to form viral particles, which are sent out of the cell and transmit the virus to nearby cells, enabling the disease to spread all through the organism.

MECHANISM OF TRANSMISSION OF INFECTION:

The viral transmission is mainly between infected hosts through contact with viral particle-containing droplets[76]. Droplets (coughs, sneezes, and mucous) can't travel not more than two meters from source[77 78].

It is widely assumed that the droplets don't stay in air.In a study discovered that droplets lingering in the air for three hours[78]. Disease can also be transmitted by potentially infectious objects (fomite-mediated transmission). Surfaces on cardboard were infectious for several hours, and surfaces on plastics and stainless steel were infectious for up to three days[78].

TESTING FOR VIRUSES:

Currently,"Quantitative reverse transcription-polymerase chain reaction (RT-qPCR)" [79] is the most common type of testing. It is broadly used in countries such as Hong Kong, the united states, Italy, Germany, and South Korea to counteract the pandemic[81 82 83]. A nasopharyngeal swab is used in the test to collect genetic information that will disclose whether the patient is infected with virus. Testing necessitates RNA seggregation, followed by synthesising a complementary DNA[83 84 85].

Antibody tests are available from companies such as Abbott[85 86]. Serological tests are far more successful, with Abbott and Swiss comapnies claiming success rates of more than 99%ELISA testing is another viable option due to its sensitivity[87]. Some of the early pandemic serological assays, however gives false positive results and overestimation of infection rates[88 89].

MANIFESTATIONS AND MECHANISMS OF SARS CORONA VIRUS-INDUCED CENTRAL NERVOUS SYSTEM DAMAGE:

Respiratory symptoms range in severity from mild to severe, and the illness can advance from mild to life-threatening severe form i,e Acute respiratory distress syndrome (ARDS. Individuals who are severely affected are more susceptible to neurological problems ranging from nausea and headaches or giddiness to more serious seizures and cerebrovascular disease (CVD). Autopsy reports on patients with severe disease revealed cerebral fluid retention and neurological degeneration . Furthermore, acute seizures in two patients with severe COVID-19 DISEASE have been reported, inferring that COVID-19 DISEASE may end up causing CNS damage. A virus comparison showed that amino acid substitutions in SARSCORONA VIRUS were responsible for functional and pathogenic differences. The SARSCORONA VIRUS spreads through the respiratory tract, the Gastro Intestinal(GI) tract, and aerosols. It infiltrates human cells by binding to the ACE2 protein, which is found in airway epithelium, renal cells, lung parenchyma, cardiovascular and gastrointestinal systems, but not the central nervous system[90 91 92]. According to neurological research[93], ACE2 is primarily expressed in the cortex, but also in microglia and neuronal cells in the brain[94] .

These findings imply that ACE2 expression is related to SARS CoV-2's neurotropic potential[95]. SARSCORONA VIRUS neuroinvasion implies that the virus can invade the respiratory tract to the Central nervous system and cause harm either directly or indirectly via the host's immune response. By infecting Blood Brain Barrier (BBB) endothelial cells or binding to the endothelial protein ACE2, SARSCORONA VIRUS can also enter the Central Nervous System (CNS). The SARSCORONA VIRUS cytokine storm may also degrade the BBB, raising permeability and allowing entry of pathogens into the Central nervous system via infected immune cells.

As a result, neuropathological correlates of SARSCORONA VIRUS disease include hypoxemic encephalitis, demyelinating disorders, cerebrovascular disease, acute myelitis, and others. These are due to spurious immune system reaction leading to secondary inflammatory tissue injury[96].

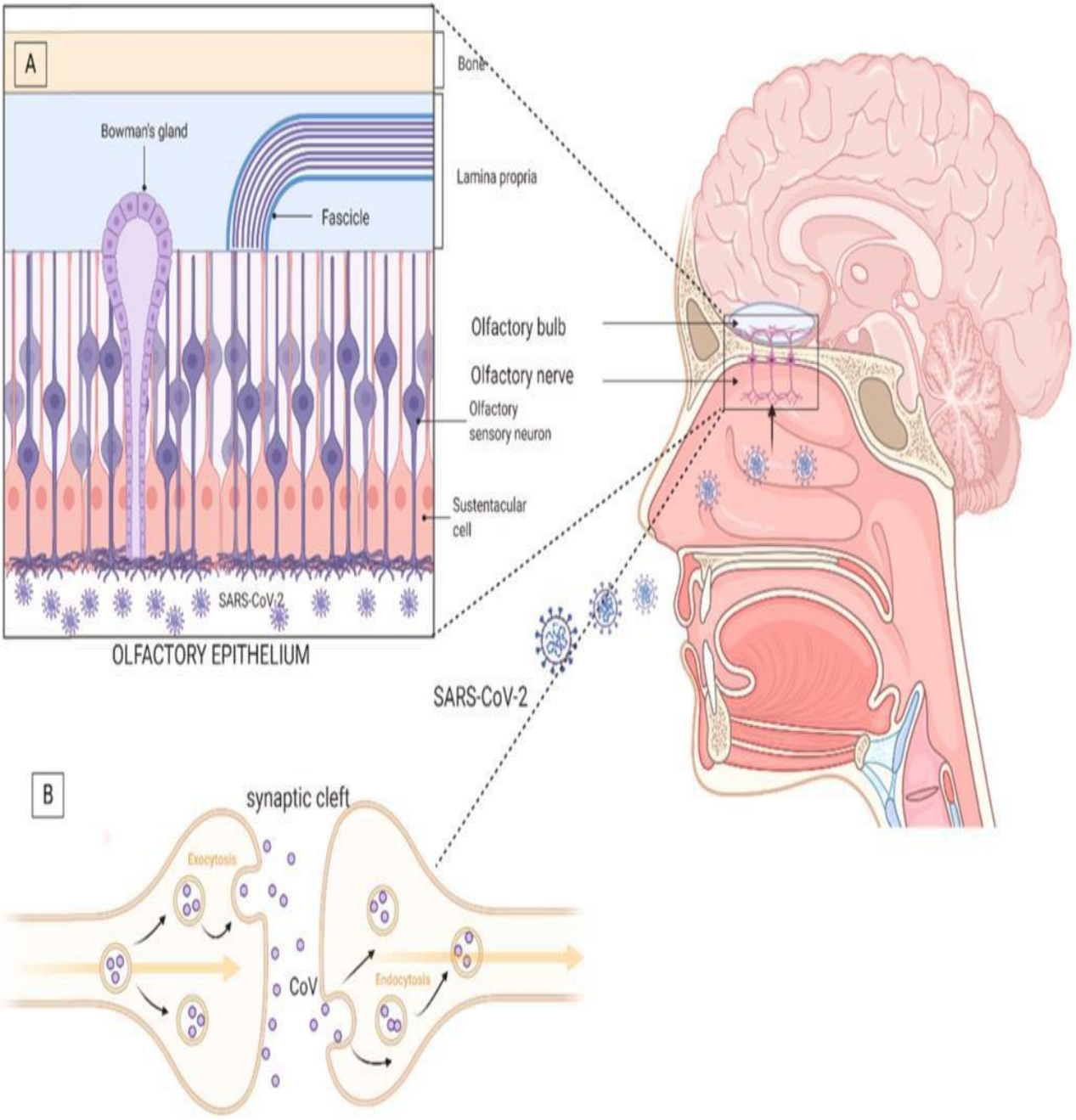


Figure 4 – Mechanism underlying SARS COV 2 Damage to CNS

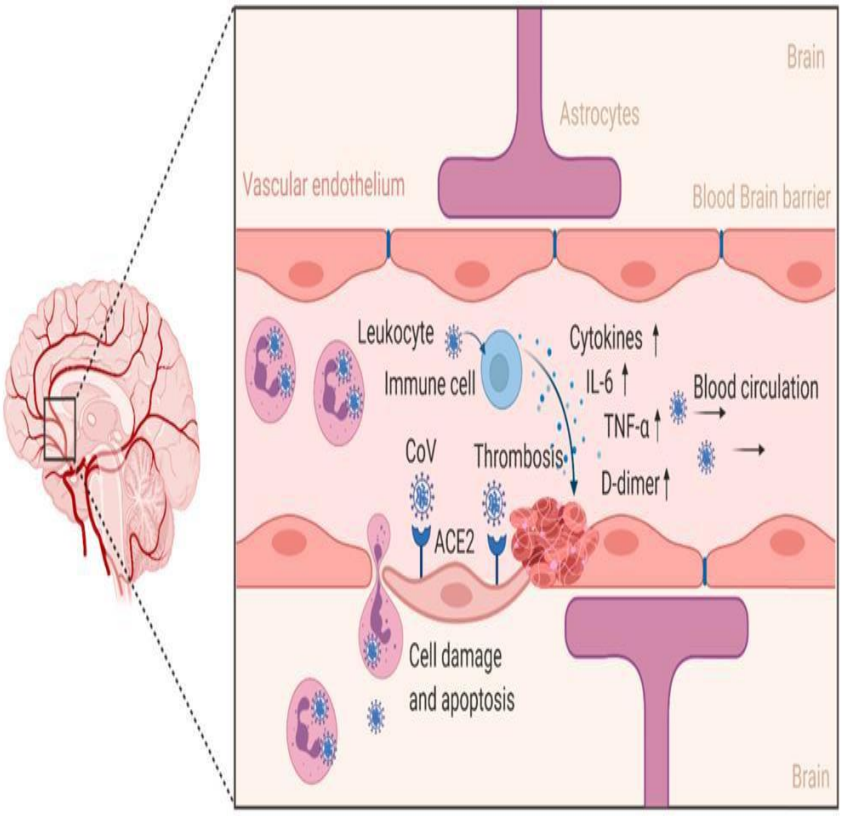


Figure 5- Mechanism underlying SARS COV 2 Damage to CNS:- Blood borne and immune pathways.

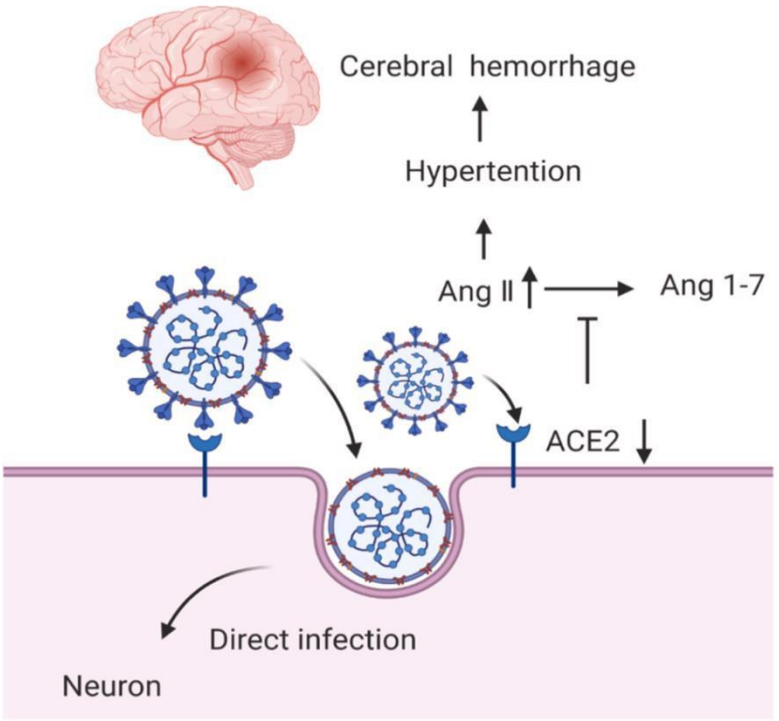


Figure 6- Mechanism underlying SARS COV 2 damage to CNS, Direct infection route.

MANIFESTATIONS OF NERVE DAMAGE CAUSED BY SARS COV-2:

Fever, cough, pneumonia, multiple organ dysfunction, and pneumonia are all clinical manifestations of SARSCORONA VIRUSinfections. In a COVID-19 DISEASE patient study conducted in Wuhan, China, 36% that is 78 out of 214 patients noted CNS manifestations such as drowsiness, and changes in mental status[49 97]. In addition, some patients had epilepsy, CVD, and consciousness issues, epilepsy[98]. The clinical picture of SARSCORONA virus-induced nervous system injury include encephalitis, olfactory and gustatory disorders, encephalitis, and metabolic toxic encephalopathy.

COVID-19 patients experience a high rate of headaches[99]. A systematic study and evaluation of 138 admitted to a hospital with COVID-19 revealed headache and dizziness incidence rates of 6.5-8.0%[100 101]. There is no known pathological correlation between headaches and COVID-19. Headaches can be probably caused by inflammatory response in the central nervous system caused by chemicals released by nociceptors; thus, the underlying pathophysiology of headaches in COVID-19 patients could involve chemokines and cytokines released by macrophages[102].

In a survey of COVID-19 patients in Spain, 57% (483/841) reported various levels of neurological problems, with severe headaches and dizziness reported early on[102].

Clinical manifestations of COVID-19 include olfactory and gustatory disorders, with a few studies indicating a potential connection among olfactory abnormalities and COVID-19 severity . A analysis of 72 COVID-19 people with the disease discovered that they all suffered from differing extents of olfactory and gustatory abnormalities[99]. While mild respiratory symptoms are common in children with COVID-19, there have also been studies of children with olfactory and gustatory abnormalities[99 103].

A recent study of three COVID-19 patients who developed encephalitis or encephalopathy reported that their cerebrospinal fluid analysis revealed elevated anti-S1 IgM

levels, as well as significant increases in the interleukins IL-6, IL-8, and IL-10. Still, the virus was not detected in the cerebrospinal fluid[104 105 106].

"Five patients in New York aged <50 years were diagnosed with COVID-19 and presented with new-onset symptoms of large-vessel ischaemic stroke between March 23 and April 7, 2020; the average National Institutes of Health Stroke Scale score was 17 points (range: 0-42 points)[107,108,109,110]

Plasminogen levels are elevated in COVID-19 patients; plasminogen-related hyperfibrinolysis can raise D-dimer levels in critically ill patients and is frequently complicated by coagulopathy and vascular endothelial cell dysfunction[111 112]. Critically ill COVID-19 patients are more likely to experience acute cerebrovascular events, which may be associated with severe thrombocytopenia and elevated D-dimer level[113,114,115].

Mechanisms underlying SARS-CoV-2-induced nerve damage:

Viruses can enter the CNS via axonal transport mechanisms by infecting peripheral neurons[116 ,117]. Viruses can infect sensory or motor nerve endings and travel retrograde or anterogradely[118,119]. SARS-CoV-2 is primarily transmitted through the nasal respiratory tract. According to research, olfactory bulb ablation can limit coronavirus invasion of the CNS[120 121]. This suggests that many viruses enter the CNS via the olfactory nerve and olfactory bulb[122]. According to a recent study, the SARS-CoV-2 virus was found in the olfactory neurons of COVID-19 patients[123]. These findings suggest that coronaviruses can enter the CNS via retrograde neuronal transmission.

"Viruses can enter the CNS and other locations by infecting leukocytes or blood-brain barrier endothelial cells[116 124]. Vascular endothelial cells, astrocytes, pericytes, and the extracellular matrix make up the blood-brain barrier. Because all vascular endothelial cells express ACE2, SARS-CoV-2 can enter the CNS by binding to this membrane-bound enzyme

on blood-brain barrier capillary endothelial cells[95]. Viruses can also cross the blood-brain barrier by infecting peripheral leukocytes, which enter the CNS via blood circulation. SARS-CoV-2-induced systemic inflammatory cytokines, chemokines, and other soluble mediators may also damage the blood-brain barrier, increasing its permeability and thus allowing viruses and infected cells to enter".

Antiviral immune responses are critical for pathogen removal from the body. The cytokine storm caused by an excessive and abnormal host immune response, on the other hand, can cause systemic inflammatory response syndrome. Increased levels of inflammatory cytokines can also lead to cognitive decline[125]. SARS-CoV-2 infection of respiratory epithelial cells, dendritic cells, and macrophages cause the release of antiviral factors (interferons), pro-inflammatory cytokines (IL-1, IL-6, and TNF), and chemokines. Another study found that severely ill patients had significantly higher levels of serum granulocyte colony-stimulatory factor (GCSF), IP-10, monocyte chemoattractant protein (MCP) 1, macrophage inflammatory protein (MIP) 1, and TNF- when compared to mildly ill patients. These studies suggest a link between cytokine storms and disease severity[49]. Viral replication can cause apoptosis in epithelial and endothelial cells, as well as vascular leakage, resulting in the release of pro-inflammatory cytokines and chemokine[126]. Critically ill patients frequently have elevated IL-6 and IL-8 levels, as well as lower lymphocyte counts, particularly for CD4- and CD8-positive cells, which can predict disease characteristics and progression. IL-6 is required for the impairment of immune cytotoxic functions[127] additionally, IL-6 may serve as a biomarker for early detection of COVID-19 progression [128] [129]

"The activation of immune cells and the increase of inflammatory factors may cause chronic inflammation of the brain and CNS complications. Moreover, tocilizumab (an IL-6 receptor blocker) can control the COVID-19-induced cytokine storm to a certain extent. Immune cell activation can cause chronic inflammation and nerve damage in the brain. These

results show that SARS-CoV-2 can trigger cytokine storms and neuro-inflammatory responses by activating mast cells, neurons, glial cells, and endothelial cells[130]. In SARS-CoV-2 patients, pulmonary inflammation can impair gas exchange, resulting in hypoxia in the CNS, followed by cerebral vasodilation and interstitial oedema". COVID-19 patients may develop venous or arterial thromboembolism as a result of inflammation and hypoxia, which can lead to complications such as ischaemic stroke, myocardial infarction, and pulmonary embolism[131 132] COVID-19 patients may develop coagulopathies caused by cytokine storms or sepsis, which can lead to stroke[133]

Sepsis-induced coagulopathy is a precursor to disseminated intravascular coagulation, which can cause prothrombin time prolongation, elevated D-dimer levels, and thrombocytopenia, followed by endothelial dysfunction and micro thrombosis[134].

ACE2 is a key component of the renin-angiotensin-aldosterone system. It is found throughout the body and CNS because it is widely expressed in the human lung parenchyma, airway epithelium, kidneys, small intestine, and vascular endothelial cells[117]. ACE2 counteracts the effects of ACE1 and angiotensin-II, providing cardiovascular protection. Because the spike protein of SARS-CoV-2 has a high affinity for ACE2, ACE2 is an important target for vaccine and antibody development[69]. SARS-high CoV-2's pathogenicity is due to its strong affinity for the human ACE2 protein[138]

Previous research has found ACE2 activity in human cerebrospinal fluid; a recent immunocytochemistry study using mixed neurons derived from human pluripotent stem cells discovered high ACE2 expression in neuronal cell bodies but low expression in axons and dendrites[139]. Although this study did not use human brain tissue, it does show that ACE2 is expressed in neurons, making neurons a potential target for SARS-CoV-2. SARS-CoV-2 infected a mouse model expressing human ACE2 protein, resulting in high viral loads in the lungs, trachea, and brain[140]. SARS-CoV-2 binding to ACE2 may cause abnormally high blood

pressure, increasing the risk of a cerebral haemorrhage. Because ACE inhibitors increase ACE2 expression, future research could look into whether patients with hypertension and Diabetes who use ACE inhibitors are more vulnerable to SARS-CoV-2 infection[141]. Despite the fact that several countries are actively working to develop antiviral drugs and vaccines, long-term nervous system sequelae caused by SARS-CoV-2 are gaining increasing attention[142 143 144]. Within six months of discharge, 509 of 797 patients had sequelae. Neurological sequelae accounted for 20.8%[145 146]. A prospective, multicenter cohort study of 73197 hospitalised COVID-19 patients in the United Kingdom from January 17 to August 4, 2020, discovered that 4.3% (3115 patients) seemed to have neurological complications[147]

SARS-COV-2 injury to neurons, whether direct or indirect, has been shown in studies to cause mental disorders and nervous system cognitive impairment[148 149 150]. The MRI of 51 COVID-19 patients taken three months after discharge was analysed[150], and severe patients appeared to have indirect brain damage related to inflammatory factors (e.g., CRP, procalcitonin, and IL-6), particularly in the thickness of the cerebral cortex; reduced cerebral blood flow and white matter microstructure changes are more serious, causing structural changes in brain volume, blood flow, and white matter microstructure.

More research is needed to address the issue of cognitive impairment[151]. COVID-19 survivors are primarily tormented by fatigue or muscle weakness, sleep difficulties, and anxiety or depression six months after acute infection and these are the primary targets of long-term rehabilitation intervention[152]. Furthermore, studies have shown that approximately 30% of COVID-19 patients have persistent olfactory dysfunction[152]. A follow-up survey of 55 COVID-19 patients who lost their sense of smell between the end of February and early march 2020 discovered that 91% of the patients regained their sense of smell after eight months, with 53% fully recovered[153] Patients with pre-existing neurological diseases are more vulnerable to

COVID-19 infection. Patients with Alzheimer's and dementia are at a greater risk of severe COVID-19 infection and neuropsychiatric disorders.

In cerebral vascular endothelial cells, ACE2 is widely expressed. The high bonding of SARS-CoV-2 spike glycoprotein for ACE2 can cause varying degrees of damage to the blood-brain barrier[154]. Furthermore, cytokine storms, hypoxia, and coagulopathy can compromise the integrity of the blood-brain barrier. These combinations could be the source of long-term nervous system sequelae[155].

Systemic inflammation has been linked to cognitive decline and neurodegenerative diseases, which may lead to neurodegeneration in COVID-19 patients in the coming years[156]. COVID-19 patients are likely to have NLRP3 inflammation activation[155], which can straightforwardly induce or worsen the neurodegenerative process that leads to Alzheimer's diseases[155]. Furthermore, NLRP3-driven and IL-1-mediated phosphokinase and phosphatase regulation play a significant role in the pathological deposition of neurofibrillary tangles, which may induce or aggravate neurodegeneration in COVID-19 patient[157]. According to research, the ACE2 protein is up-regulated in the brains of Alzheimer's disease patients, and there is a substantial positive correlation between ACE2 protein expression and oxidative stress[158]. This could be one of the factors contributing to the SARS-CoV-2 virus's long-term nervous system sequelae.

According to Ministry of Health and Family welfare by Government of India data states that there are 5 lakhs Death happened till October 2022 where as according to the World Health Organisation (WHO) cumulative deaths are 66 lakhs .

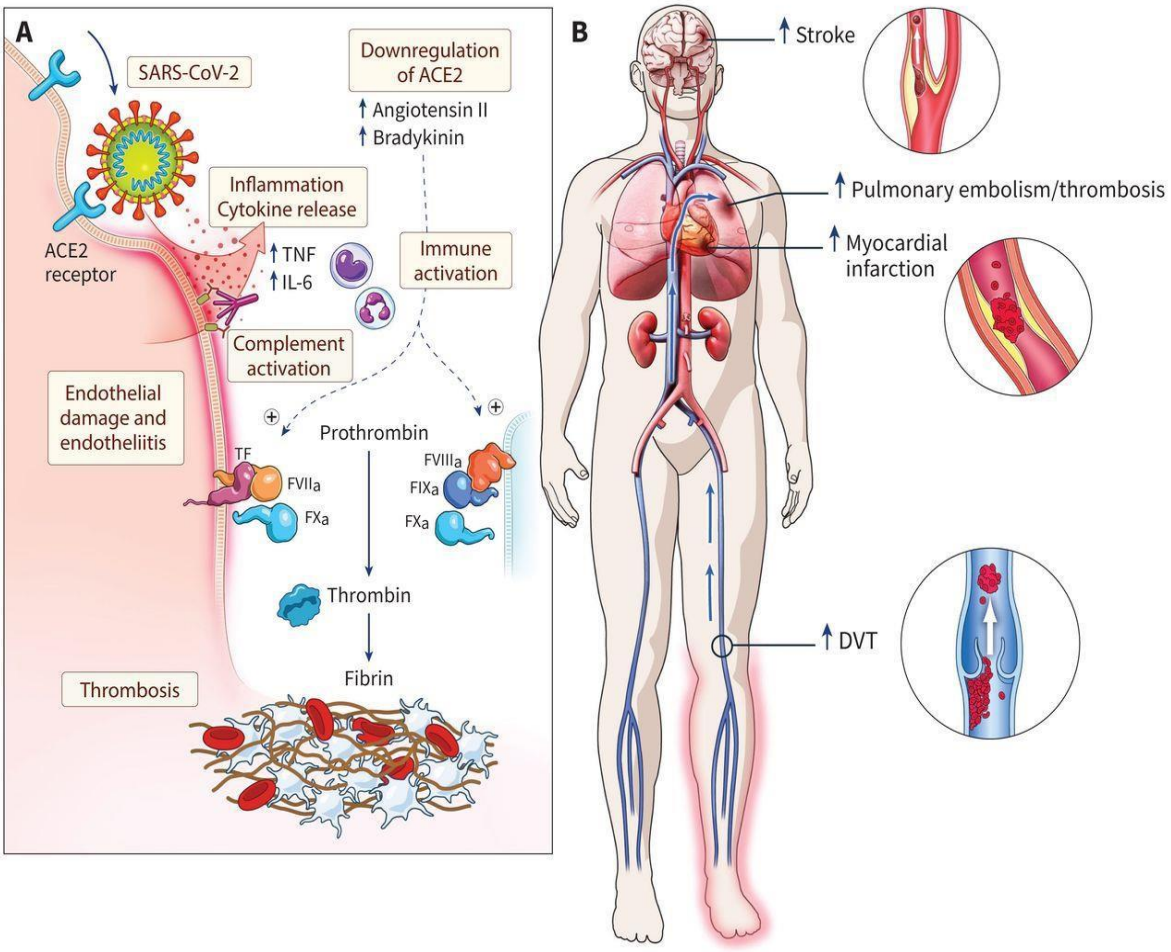


Figure 7- Thrombo Embolisim Involving Different Systems

MATERIALS AND METHODS:

SOURCE OF DATA:

Subjects who have been diagnosed as COVID-19 positive and got recovered are included in the study after taking informed consent at Shri B.M. Patil Medical College, Hospital and Research Centre, BLDE (DEEMED TO BE UNIVERSITY), Vijayapura, between November 2020 to October 2022.

METHOD OF COLLECTION OF DATA:

1. **STUDY POPULATION:**

   This study was done in Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura, from November 2020 to November 2022 in individuals who have recovered from COVID-19.

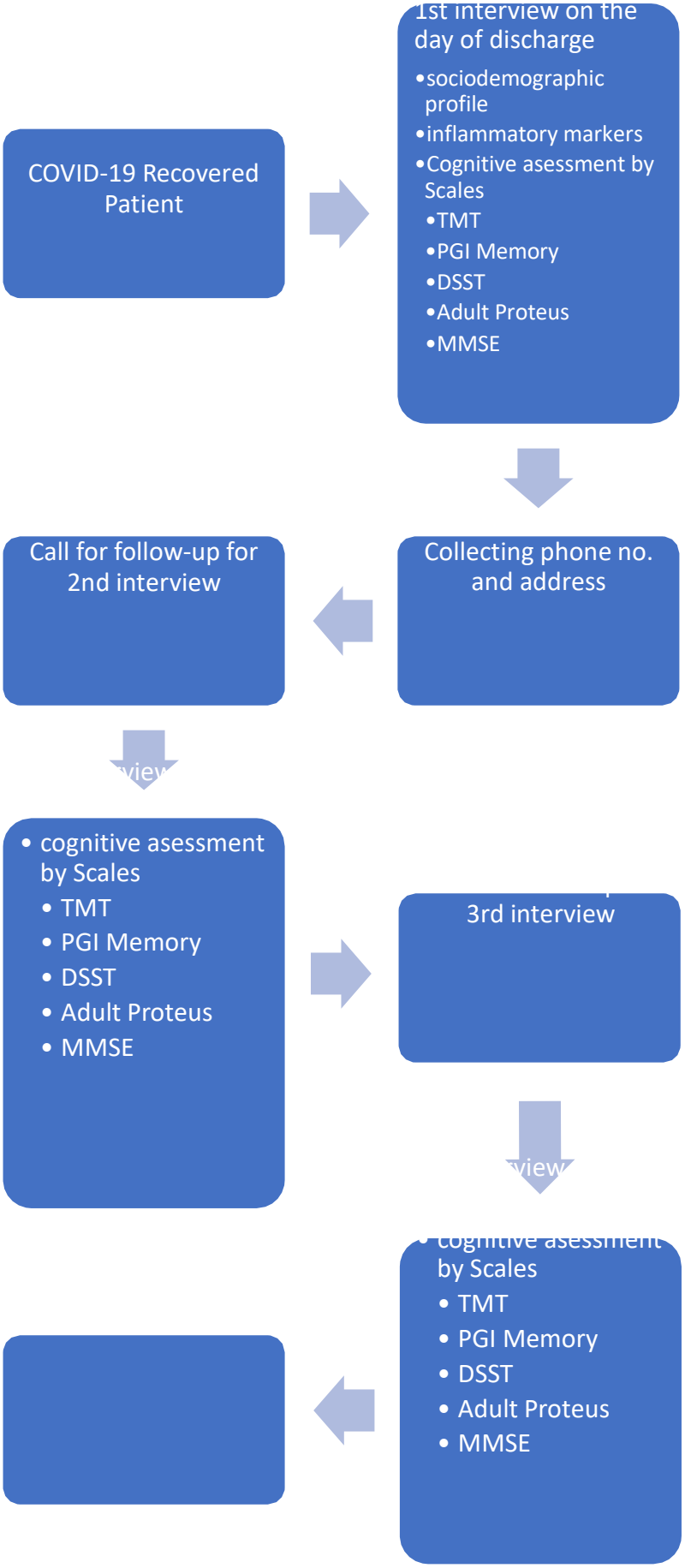
2. **INCLUSION CRITERIA:**

   - People in the age group of 18 to 60 years who were diagnosed as COVID-19 Positive, got admitted at Shri B. M Patil Medical College, Hospital and Research Center, BLDE (DU), and got recovered and discharged, were interviewed at the time of discharge, after one month and after three months.
   - Subjects willing to consent.

3. **EXCLUSION CRITERIA:**

   - Any patients with a Pre-existing mental illness or cognitive impairment or patient with mental retardation.
   - Previous history of Stroke.

METHODOLOGY:



SAMPLE SIZE

With the anticipated Mean±SD of the Sign coding test among after recovery of COVID-19 patients 31.14±9.02 [8], the study would require a sample size of 81 patients with a 95**%** level of confidence and a precision of 2**.**

Formula used

- $\mathbf{n=\frac{z^2 S^2}{d^2}}$

Where Z= Z statistic at α level of significance

d^2= Absolute error

S= Standard deviation

q= 100-p

Dropout rate =10% of 81

Sample size=Minimum 90

STATISTICAL ANALYSIS:

- The data obtained will be entered into a Microsoft Excel sheet, and statistical analysis will be performed using a statistical package for the social sciences (Version 20).
- Results will be presented as Mean (Median) ±SD, counts and percentages and diagrams.
- For not normally distributed variables Friedman test.ll be used. Categorical variables will be compared using the Chi-square test.
- $p<0.05$ will be considered statistically significant. All statistical tests will perform two-tailed.

TYPE OF STUDY: Prospective longitudinal study

COGNITIVE ASSESSMENT:

Assessment of cognitive functions is done by using the Neuropsychological tests

NEUROPSYCHOLOGICAL TESTS

TRAIL MAKING TEST (TMT):

Trails A and B are timed validated assessments of complex attention. Part A of the Trails Making Test comprises of 25 circles on a sheet of paper with numbers 1-25 written in random locations. The subject must link the circles in numerical order as as fast as possible in less than 90 seconds. Part B of the Trails Making Test comprises of 25 circles on a sheet of paper with numbers 1-13 and letters A-L written in random locations. It necessitates the subject to link the circles as as fast as possible in numerical and alphabetical order, alternating among numbers and letters in less than 180 seconds. With a pencil, the trails are finalised on worksheets.This tests visual scanning and visuomotor tracking,which measure the speed of processing measured in seconds.

DIGIT-SYMBOL SUBSTITUTION TEST(DSST):

A timed neuropsychiatric test sensitive to onset of dementia is digit-symbol substitution. It consists of a top-of-the-page key of nine digit-symbol pairs, preceded by rows of digits below missing symbols. It necessitates the subject to match symbols to digits as quickly as possible using the provided key. The number of correct symbols within 120 seconds is tallied. The test is completed with a pencil on a worksheet.

The DSST assesses a variety of cognitive operations. To perform well on the DSST, you must have good motor speed, attention, and visuoperceptual functions, including the ability to scan and write or draw (ie, basic manual dexterity). Associative learning may also have an impact on performance. For example, if pairings are quickly learned after the first few trials, the subject's performance speed will improve because he or she will no longer have to refer to the key to verify the correctness of each pairing. The conscious decision to use this learning strategy to improve performance speed necessitates the executive functions of planning and

strategizing. Working memory, another executive function, is likely required to remember task rules and to keep required symbol digit pairs up to date.

P.G.I.MEMORY SCALE(PGIMS):

"It defines memory as the ability to retain and reproduce impression's once perceived intentionally. It includes verbal and non-verbal material and measures remote, recent and immediate, short-term, very short-term, intermediate-term and long-term memories. There are ten subtests, standardized on adult subjects in the age range of 20 to 45 years. Its test-retest reliability over a period of one week ranges from 0.69 to 0.85 for ten subtests (N = 40) and for the total test about 0.90 (test-retest and split-half). The correlation of PGIMS with Boston's Memory Scale and Wechsler's Memory Scale were found to be 0.71 and 0.85, respectively. Elderly subjects obtained significantly lower scores than the younger subjects. Cases suffering from organic brain pathology and functional psychotic conditions obtained significantly lower scores than normals and neurotics." It has satisfactory cross-validity and provides quintile norms and a profile. Scores of the subjects suffering from organic brain pathology, functional psychosis and neurosis fall in the lowest, 2nd and middle quintiles, respectively. Thus the result showed that the PGI Memory scale is a satisfactorily reliable and valid tool to measure memory in the clinic population. (Pershad, 1977; Pershad and Wig, 1976, 1988).

In our study we used PGIMS because it is designed to Indian population and more over it is present in regional language which is more easy to apply to the Indian population.

MINI-MENTAL STATE EXAMINATION (MMSE):

Folstein developed the Mini-Mental State Examination (MMSE) or Folstein test in 1975. It is a 30-point questionnaire used extensively in research and clinical settings to measure cognitive impairment. It is commonly used to screen for onset of dementia. It is also used to predict the severity and progression of cognitive impairment and to track an individual's cognitive changes over time, making it an efficient method to document an individual's response to treatment.

PORTEUS MAZE TEST (PMT):

The Porteus Maze test (PMT) is a type of psychological assessment. Its purpose is to assess psychological planning ability and foresight. It is a nonverbal intelligence test. Stanley Porteus, a psychology professor at the University of Hawaii, created it.

The subject must solve a series of mazes as part of the test. The mazes vary in difficulty. The test lasts 15-60 minutes and allows the subject to complete as many as mazes feasible. The test is used as a supplement to the Wechsler intelligence scales.

RESULTS

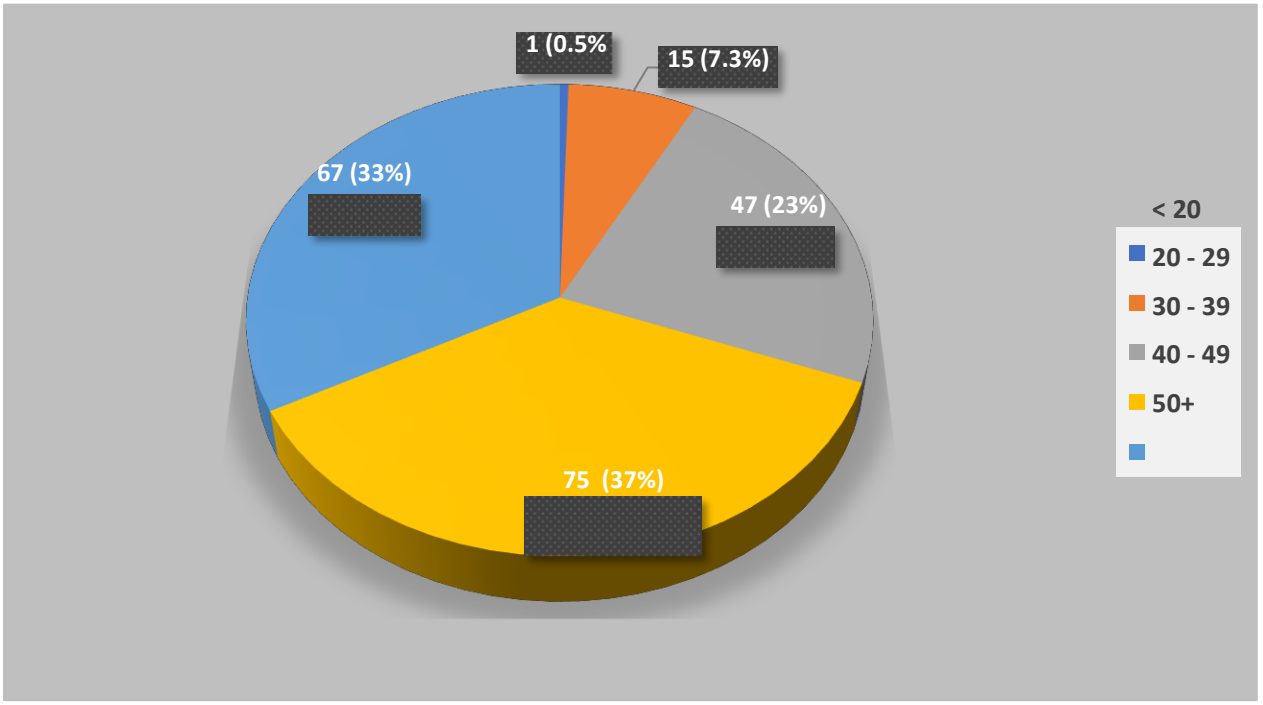
AGE DISTRIBUTION:

It was observed that the majority of the patients (36.6%) belonged to the age groups of 40 to 49, followed by (32.7%) belonging to the age group 50 to 60 years. The remaining (22.9%) belonged to the age group 30 to 39 years.

TABLE 1: Distribution of patients according to age:

Age (YEARS)	Number of Cases	Percentage of cases
< 20	1	0.5
20 - 29	15	7.3
30 - 39	47	22.9
40 - 49	75	36.6
50 -60	67	32.7
Total	205	100.0

Graphical Representation 1: Distribution of patients according to age:



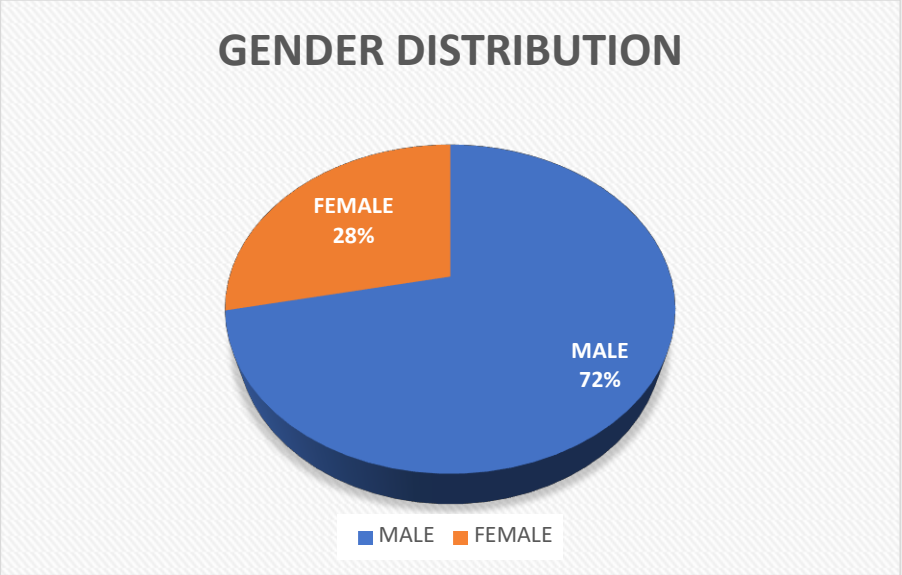
GENDER DISTRIBUTION:

It was observed that the majority were males, with 71.7% of patients(147 in number), while 28.3% of subjects were females (28 in number).

Table 2:Distribution of patients according to Gender:

Gender	Number of cases	Percentage of cases
Male	147	71.7
Female	58	28.3
Total	205	100.0

Graphical Representation 2: Distribution of patients according to Gender:



PSYCHOLOGICAL ASSESSMENTS:

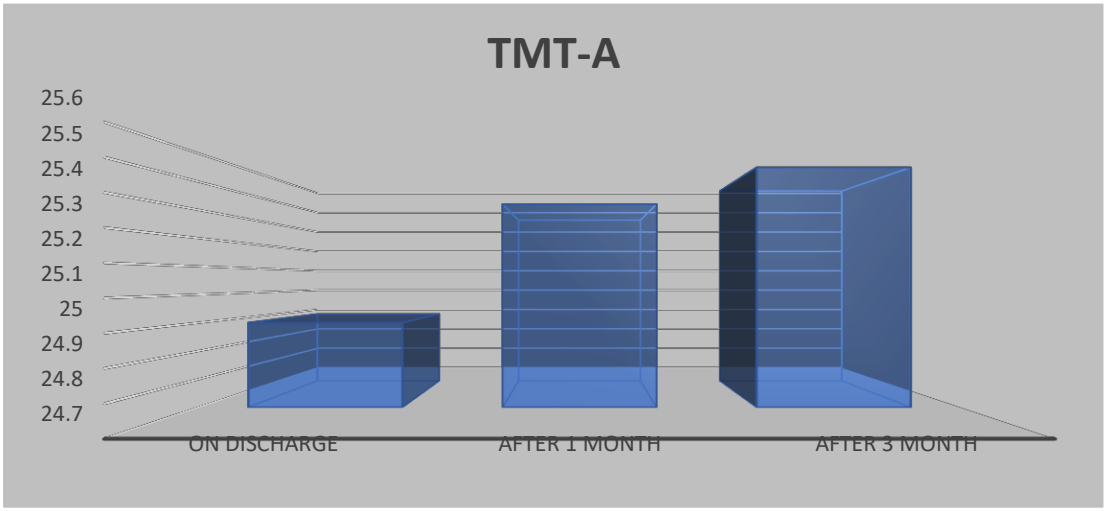
1. Trail Making Test -A (TMT-A):

In this Trail making test-A(TMT-A), we observed that the average time taken on discharge is 25.0 seconds, after one month is 25.42 seconds, and after three months is 25.55 seconds. The difference in means from the day of discharge to after one month and after three months is 0.42 seconds and 0.55 seconds, respectively, which suggests that there is a subtle increase in time taken by the subjects to finish the test. We found that with a p-value of 0.0001, it is statistically significant.

Table 3 – Trail Making Test -A (TMT-A):

Parameters	TMT-A				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	25.00			5.190	36.286	0.0001*
After 1 month	25.42	0.42	1.7%	5.914		
After 3 month	25.55	0.55	2.2%	6.241		
*: Statistically significant						

Graphical Representation 3: Trail Making Test -A (TMT-A):



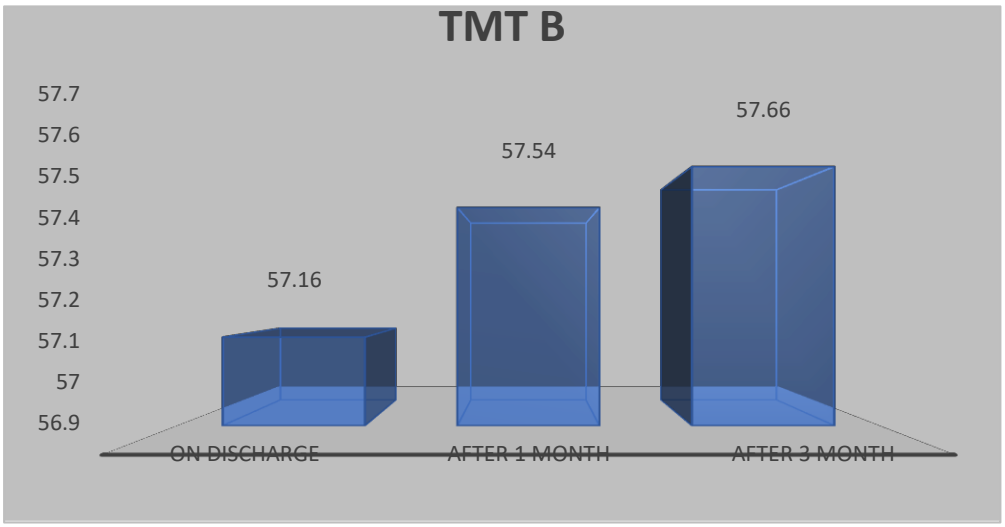
2. Trail Making Test -B(TMT-B):

In this Trail making test-B(TMT-B), we observed that the average time taken on discharge is 57.16 seconds, after one month is 57.54 seconds and after three months is 57.66 seconds. The difference in means from the day of discharge to after one month and after three months is 0.38 seconds and 0.5 seconds, respectively, which suggests that there is a subtle increase in time taken by the subjects to finish the test. We found that with a p-value of 0.0001, it is statistically significant.

Table 4 – Trail Making Test -B (TMT-B):

Parameters	TMT-B				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	57.16			12.848	42.000	0.0001*
After 1 month	57.54	0.38	0.66%	13.576		
After 3 month	57.66	0.5	0.87%	13.836		
*: Statistically significant						

Graphical Representation 4: Trail Making Test -B (TMT-B):



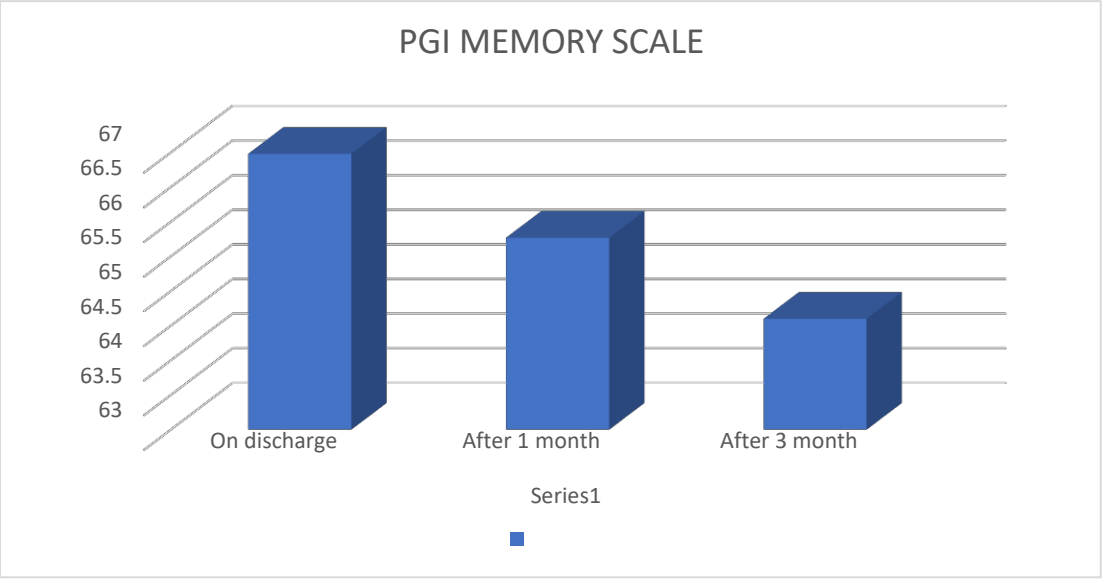
3. PGI MEMORY SCALE:

In this PGI Memory Scale, the average total score on discharge is 66.98. After one month is 65.77, and after three months is 64.60, which shows a decrease in the scores, and the differences in the means from the day of discharge to the after 1 month and three months are 1.21 and 2.38, respectively. We found that with a p-value of 0.0001, it is statistically significant.

Table 5- PGI MEMORY SCALE

Parameters	PGI MEMORY SCALE				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	66.98			6.421	43.517	0.0001*
After 1 month	65.77	1.21	1.80%	9.208		
After 3 month	64.60	2.38	3.54%	12.308		
*: Statistically significant						

Graphical Representation 5: PGI MEMORY SCALE



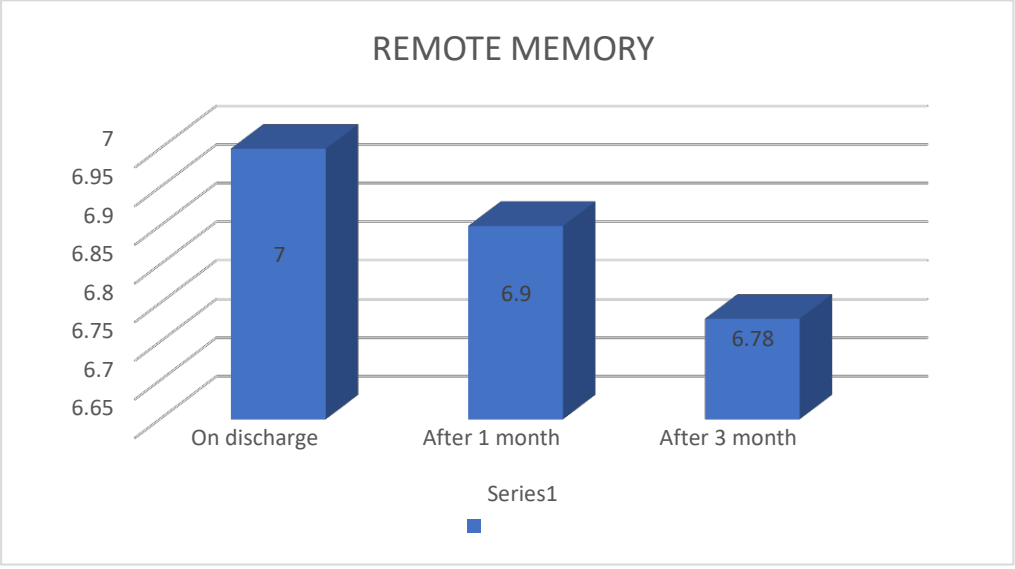
3.1 REMOTE MEMORY:

This is the subtest of the PGI MEMORY SCALE. In this Remote memory, the subjective mean score on the day of discharge is 7.00. After 1 month, it is 6.90 and after 3 months is 6.78. The differences in the mean score after one month and after three months are 6.90 and 6.78, respectively. Even though the average mean scores are in the percentile range of 40 to 60 and the total score comes to 82-86, and the level of remote memory is good according to the PGI MEMORY scale, there is a subtle decrease in the levels which suggest of cognitive decline in the remote memory. We found that with a p-value of 0.0001, it is statistically significant.

Table 6- REMOTE MEMORY

Parameters	REMOTE MEMORY				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	7.00			0.00	42.000	0.0001*
After 1 month	6.90	0.10	1.42%	0.304		
After 3 month	6.78	0.22	3.14%	0.678		
*: Statistically significant						

Graphical Representation 6: REMOTE MEMORY



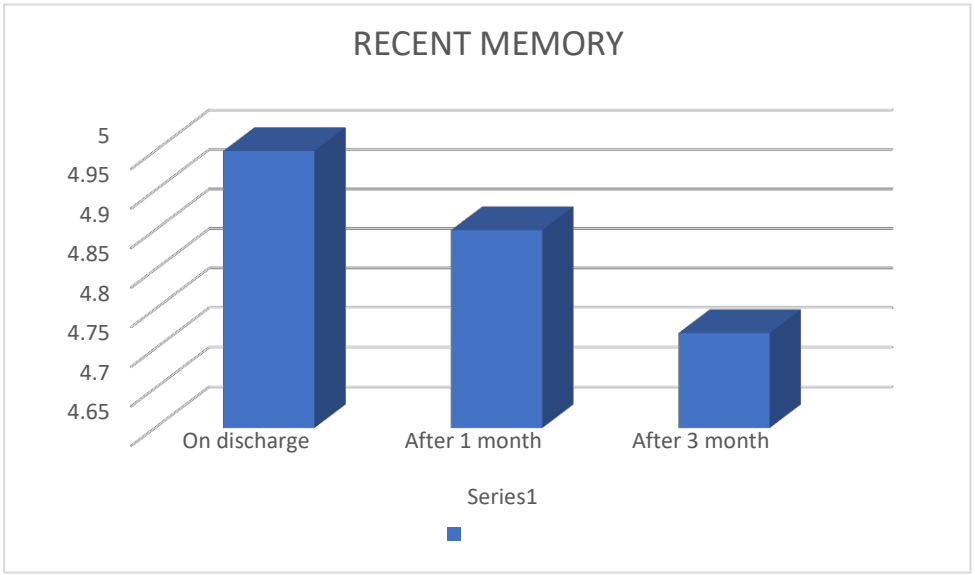
3.2 RECENT MEMORY:

This is the subtest of the PGI MEMORY SCALE. In this Recent memory, the subjective mean score on the day of discharge is 5.00. After 1 month, it is 4.90 and after 3 months is 4.77. The differences in the mean score after one month and after three months are 0.10 and 0.23, respectively. The average mean score is 5.00, which comes in the percentile range of 40 to 60, and the total score comes to 82-86, and level of recent memory is good according to the PGI MEMORY scale, but there is a subtle decrease in the levels .which suggest of cognitive decline in the recent memory. We found that with a p-value of 0.0001, it is statistically significant.

Table 7- RECENT MEMORY:

Parameters	RECENT MEMORY				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	5.00			0.000	43.000	0.0001*
After 1 month	4.90	0.10	2.0%	0.304		
After 3 month	4.77	0.23	4.6%	0.680		
*: Statistically significant						

Graphical Representation 7: RECENT MEMORY:



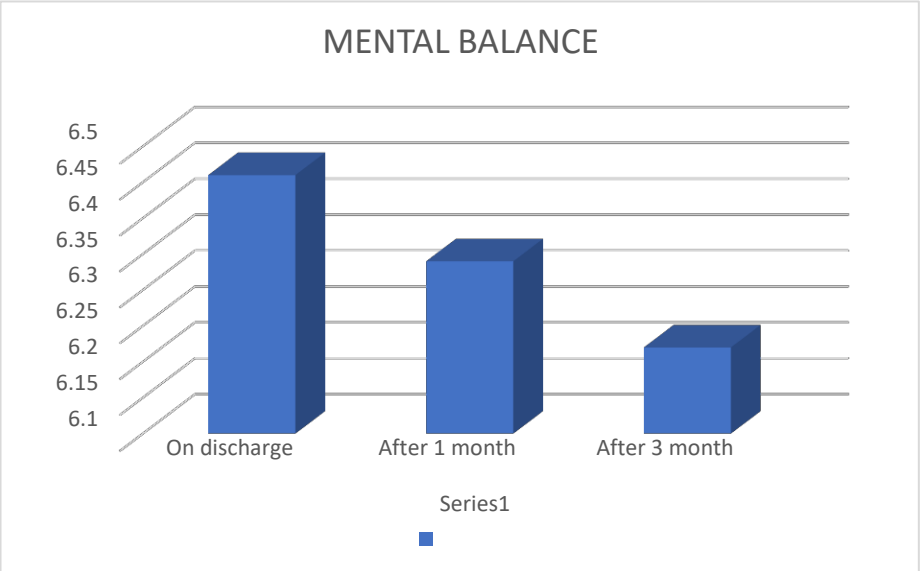
3.3 MENTAL BALANCE:

This is the subtest of the PGI MEMORY SCALE. In this Mental Balance, the subjective mean score on the day of discharge is 6.46. After one month, it is 6.34, and after 3 months, it is 6.22. The differences in the mean score after one month and after three months are 0.12 and 0.24, respectively. The average mean scores are in the percentile range of 0 to 20 and 20 to 40, and the total score comes from 0 to 75 and 76 to 81, and the level of Mental balance is low to very low according to the PGI MEMORY scale. There is a subtle decrease in the levels, suggesting a cognitive decline in the Mental balance. We found that with a p-value of 0.0001, it is statistically significant.

Table 8- MENTAL BALANCE

Parameters	MENTAL BALANCE				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	6.46			0.668	42.000	0.0001*
After 1 month	6.34	0.12	1.9%	0.929		
After 3 month	6.22	0.24	3.7%	1.259		
*:Statistically significant						

Graphical Representation 8- MENTAL BALANCE



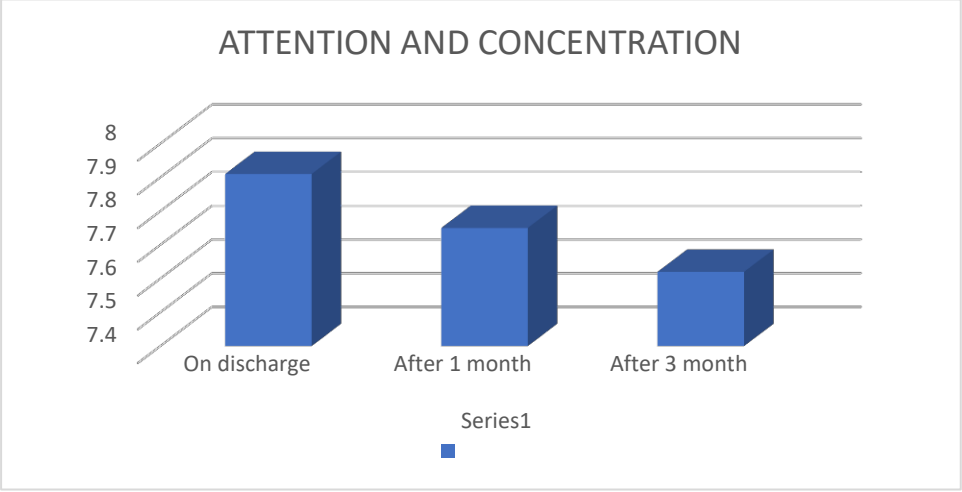
3.4 ATTENTION AND CONCENTRATION:

This is the subtest of the PGI MEMORY SCALE. In this Attention and concentration, the subjective mean score on the day of discharge is 7.91. After 1 month, it is 7.75 and after 3 months is 6.78. The differences in the mean score after one month and after three months are 0.16 and 0.29, respectively. The average mean scores are in the percentile range of 0 to 20, and the total score comes from 0 to 75 and level of Attention and concentration is very low according to the PGI MEMORY scale, and there is a subtle decrease in the levels which suggest of cognitive decline in the Attention and concentration. We found that with a p-value of 0.0001, it is statistically significant.

Table 9- ATTENTION AND CONCENTRATION

Parameters	ATTENTION AND CONCENTRATION				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	7.91			1.320	42.000	0.0001*
After 1 month	7.75	0.16	2.02%	1.601		
After 3 month	7.62	0.29	3.67%	1.905		
*: Statistically significant						

Graphical Representation 9- ATTENTION AND CONCENTRATION:



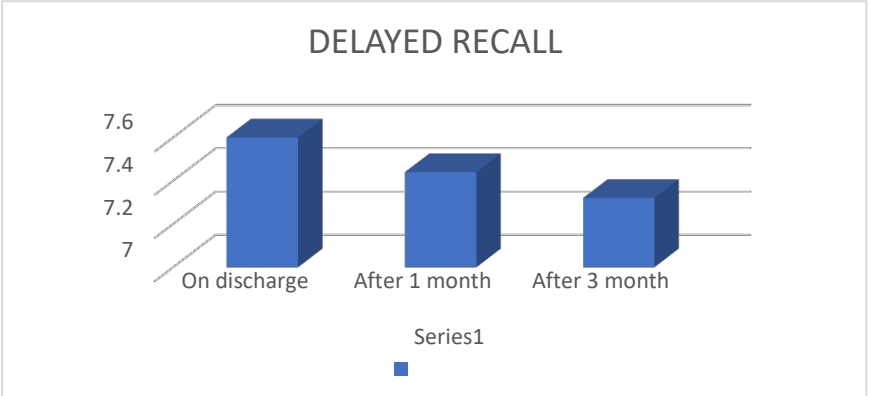
3.5 DELAYED RECALL:

This is the subtest of the PGI MEMORY SCALE. In this Delayed recall, the subjective mean score on the day of discharge is 7.60. After one month, it is 7.44, and after 3 months, it is 7.32. The differences in the mean score after one month and after three months are 0.16 and 0.28, respectively. The average mean scores are in the percentile range of 20 to 40 and 0 to 20, and the total score comes to 76 to 81 and 0 to 75 level of Attention and concentration is low on the day of discharge, and the levels decreased to very low in the follow-ups according to the PGI MEMORY scale, which suggests of cognitive decline in the Delayed recall. We found that with a p-value of 0.0001, it is statistically significant.

Table 10. DELAYED RECALL

Parameters	DELAYED RECALL				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	7.60			1.096	42.000	0.0001*
After 1 month	7.44	0.16	2.10%	1.415		
After 3 month	7.32	0.28	3.68%	1.730		
*: Statistically significant						

Graphical Representation 10- DELAYED RECALL:



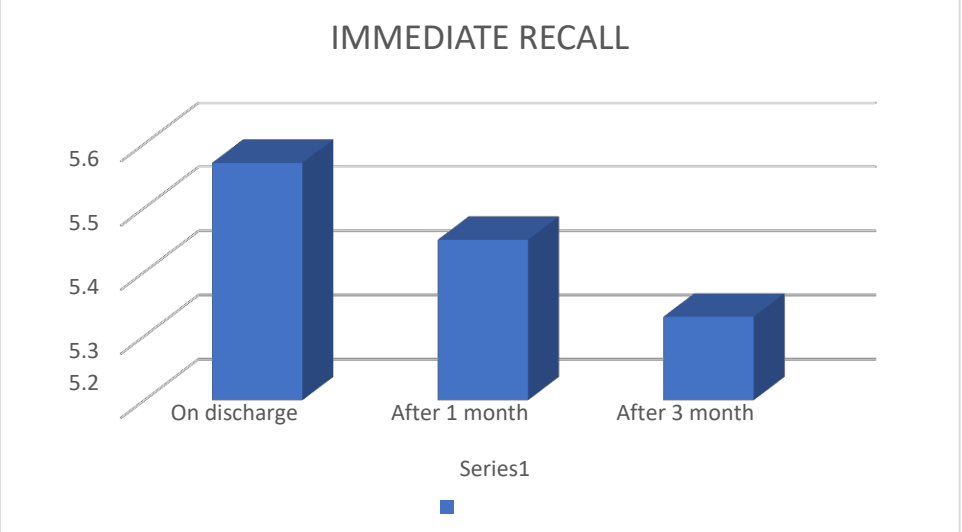
3.6 IMMEDIATE RECALL:

This is the subtest of the PGI MEMORY SCALE. In this Immediate Recall, the subjective mean score on the day of discharge is 5.57. After 1 month, it is 5.45 and after 3 months is 5.33. The differences in the mean score after one month and after three months are 0.12 and 0.24, respectively. The average mean scores are in the percentile range of 0 to 20. The total score comes from 0 to 75, and the level of Immediate recall is very low according to the PGI MEMORY scale. There is a subtle decrease in the levels, which suggest of cognitive decline in Immediate recall. We found that with a p-value of 0.0001, it is statistically significant.

Table 11- IMMEDIATE RECALL

Parameters	IMMEDIATE RECALL				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	5.57			1.025	36.940	0.0001*
After 1 month	5.45	0.12	2.15%	1.186		
After 3 month	5.33	0.24	4.30%	1.468		
*: Statistically significant						

Graphical Representation 11- IMMEDIATE RECALL:



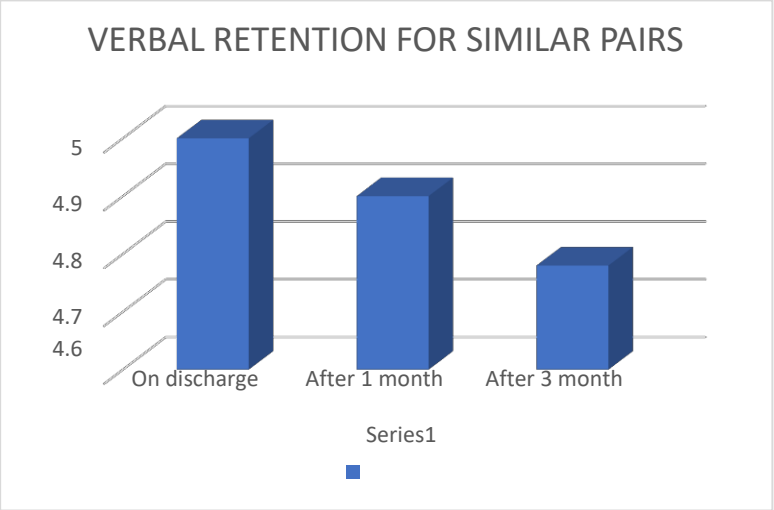
3.7 VERBAL RETENTION FOR SIMILAR PAIRS:

This is the subtest of the PGI MEMORY SCALE. In this Verbal retention for similar pairs, the subjective mean score on the day of discharge is 5.00. After one month, it is 4.90, and after 3 months, it is 4.78. The differences in the mean score after one month and after three months are 0.1 and 0.22, respectively. The average mean scores are in the percentile range of 40 to 60, and the total score comes to 82 to 86, and the level of Verbal retention for similar pairs is good according to the PGI MEMORY scale. There is a subtle decrease in the levels, which suggest of cognitive decline in Verbal retention for similar pairs. We found that with a p-value of 0.0001, it is statistically significant.

Table 12- VERBAL RETENTION FOR SIMILAR PAIRS

Parameters	VERBAL RETENTION FOR SIMILAR PAIRS				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	5.00			0.00	42.000	0.0001*
After 1 month	4.90	0.1	2%	0.30		
After 3 month	4.78	0.22	4.4%	0.68		
*: Statistically significant						

Graphical Representation 12- VERBAL RETENTION FOR SIMILAR PAIRS:



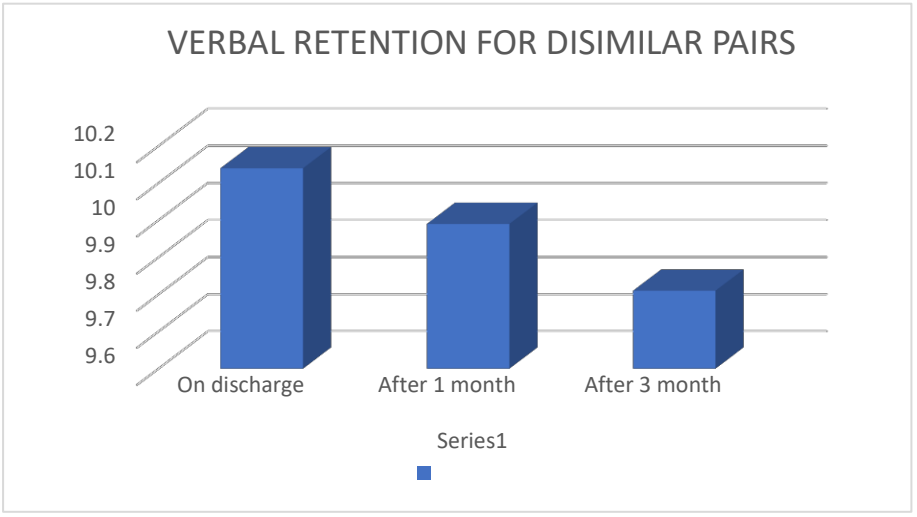
3.8 VERBAL RETENTION FOR DISSIMILAR PAIRS:

This is the subtest of the PGI MEMORY SCALE. In this Verbal retention for Dissimilar pairs, the subjective mean score on the day of discharge is 10.14. After one month, it is 9.99 and after 3 months is 9.81. The differences in the mean score after one month and after three months are 0.15 and 0.33, respectively. The average mean scores are in the percentile range of 20 to 40, the total score comes to 76 to 81, and the level of Verbal retention for Dissimilar pairs is Low according to the PGI MEMORY scale. There is a subtle decrease in the levels, which suggest of cognitive decline in Verbal retention for dissimilar pairs. We found that with a p-value of 0.0001, it is statistically significant.

Table 13 VERBAL RETENTION FOR DISSIMILAR PAIRS:

Parameters	VERBAL RETENTION FOR DISSIMILAR PAIRS				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	10.14			1.23	40.095	0.0001*
After 1 month	9.99	0.15	1.47%	1.50		
After 3 month	9.81	0.33	3.25%	1.60		
*: Statistically significant						

Graphical Representation 13- VERBAL RETENTION FOR DISSIMILAR PAIRS:



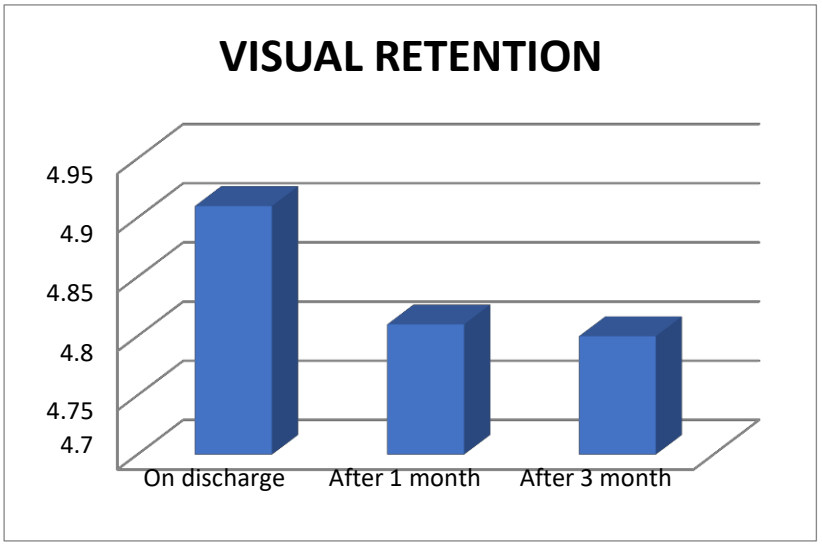
3.9 VISUAL RETENTION:

This is the subtest of the PGI MEMORY SCALE. In this Visual retention, the subjective mean score on the day of discharge is 4.91. After 1 month is 4.81 and after 3 months is 4.8. The differences in the mean score after one month and after three months are 0.1 and 0.11, respectively. The average mean scores are in the percentile range of 20 to 40, the total score comes to 76 to 81, and the level of Verbal retention for Dissimilar pairs is Low according to the PGI MEMORY scale. There is a subtle decrease in the levels, which suggest of cognitive decline in Verbal retention for dissimilar pairs. We found that with a p-value of 0.0001, it is statistically significant.

Table 14- VISUAL RETENTION:

Parameters	VISUAL RETENTION				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	4.91			1.349	40.925	0.0001*
After 1 month	4.81	0.1	2.03%	1.574		
After 3 month	4.8	0.11	2.24%	1.585		
*: Statistically significant						

Graphical Representation 14- VISUAL RETENTION:



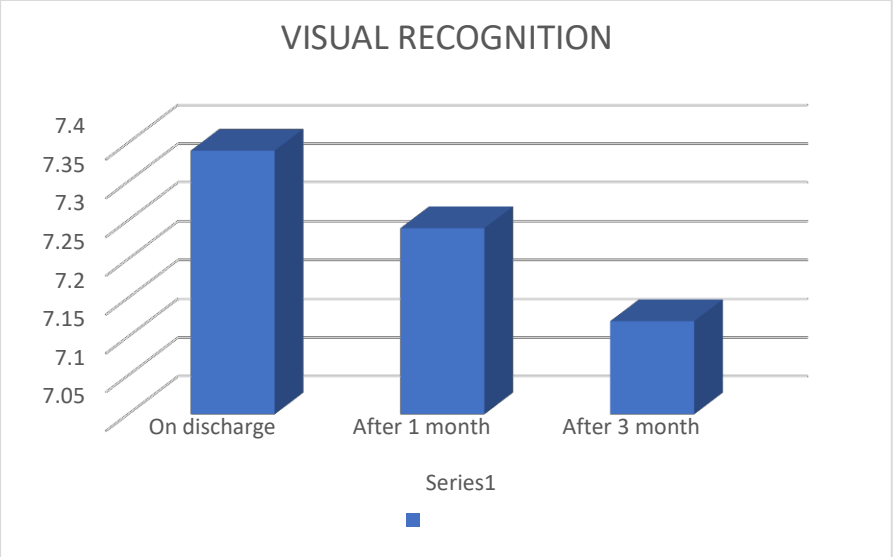
3.10 VISUAL RECOGNITION:

This is the subtest of the PGI MEMORY SCALE. In this Visual recognition, the subjective mean score on the day of discharge is 7.39. After one month, it is 7.29, and after 3 months, it is 7.17. The differences in the mean score after one month and after three months are 0.1 and 0.22, respectively. The average mean scores are in the percentile range of 0 to 20, the total score comes from 0 to 75, and the level of Visual recognition is very low according to the PGI MEMORY scale. There is a subtle decrease in the levels, which suggests a cognitive decline in Visual recognition. We found that with a p-value of 0.0001, it is statistically significant.

Table 15 VISUAL RECOGNITION

Parameters	VISUAL RECOGNITION				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	7.39			1.38	41.518	0.0001*
After 1 month	7.29	0.1	1.35%	1.57		
After 3 month	7.17	0.22	2.97%	1.85		
*: Statistically significant						

Graphical Representation 15- VISUAL RECOGNITION:



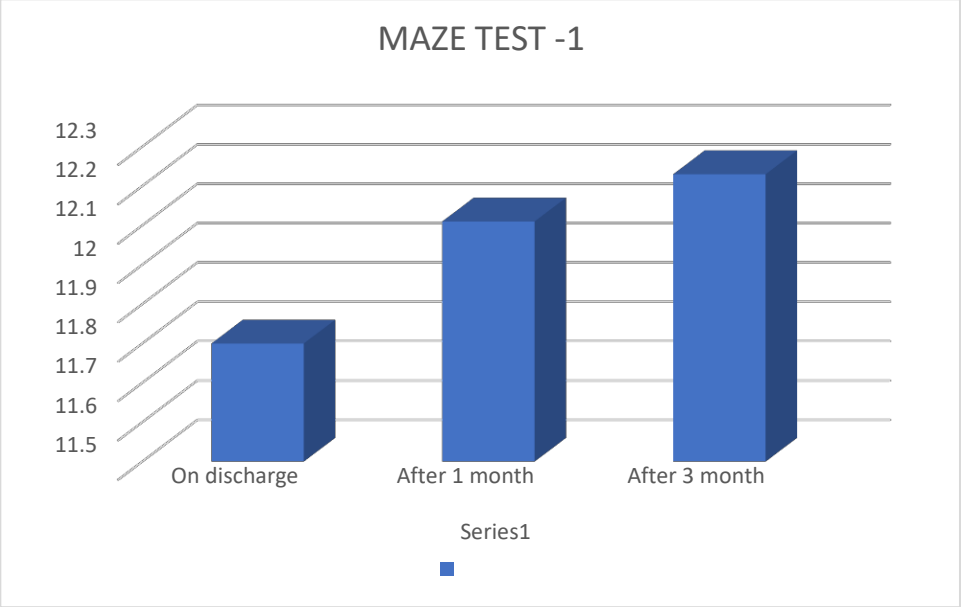
4.0 MAZE TEST 1:

In this Maze Test 1, we observed that the average time taken to complete the test on discharge is 11.80 seconds. After one month is 12.11 seconds, and after three months is 12.23 seconds. The difference in means from the day of discharge to after one month and after three months is 0.31 seconds and 0.43 seconds, respectively. This suggests that there is a subtle increase in time taken by the subjects to finish the test. We found that with a p-value of 0.0001, it is statistically significant

Table 16- MAZE TEST 1:

Parameters	MAZE TEST 1				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	11.80			2.411	42.000	0.0001*
After 1 month	12.11	0.31	2.62%	3.206		
After 3 month	12.23	0.43	3.64%	3.550		
*: Statistically significant						

Graphical Representation 16: MAZE TEST 1:



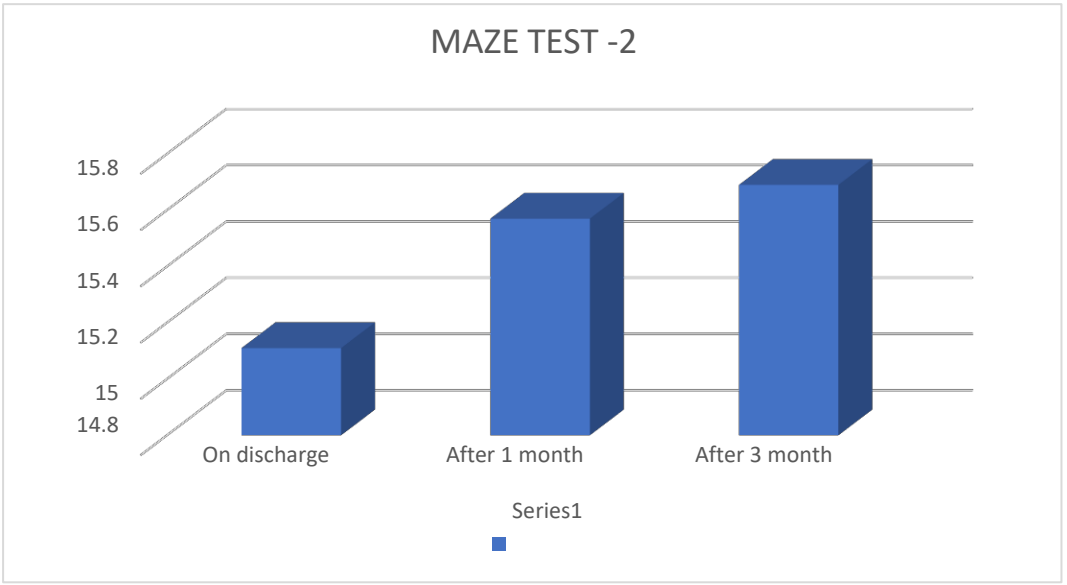
4.1 MAZE TEST 2:

In this Maze Test 2, we observed that the average time taken to complete the test on discharge is 15.11 seconds. After one month is 15.57 seconds, and after three months is 15.69 seconds. The difference in means from the day of discharge to after one month and after three months is 0.46 seconds and 0.58 seconds, respectively. Which suggests that there is a subtle increase in the time taken by the subjects to complete the test. We found that with a p-value of 0.0001, it is statistically significant

Table 17- MAZE TEST 2:

Parameters	MAZE TEST 2				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	15.11			3.495	40.000	0.0001*
After 1 month	15.57	0.46	3.04%	4.244		
After 3 month	15.69	0.58	3.84%	4.541		
*: Statistically significant						

Graphical Representation 17- MAZE TEST 2:



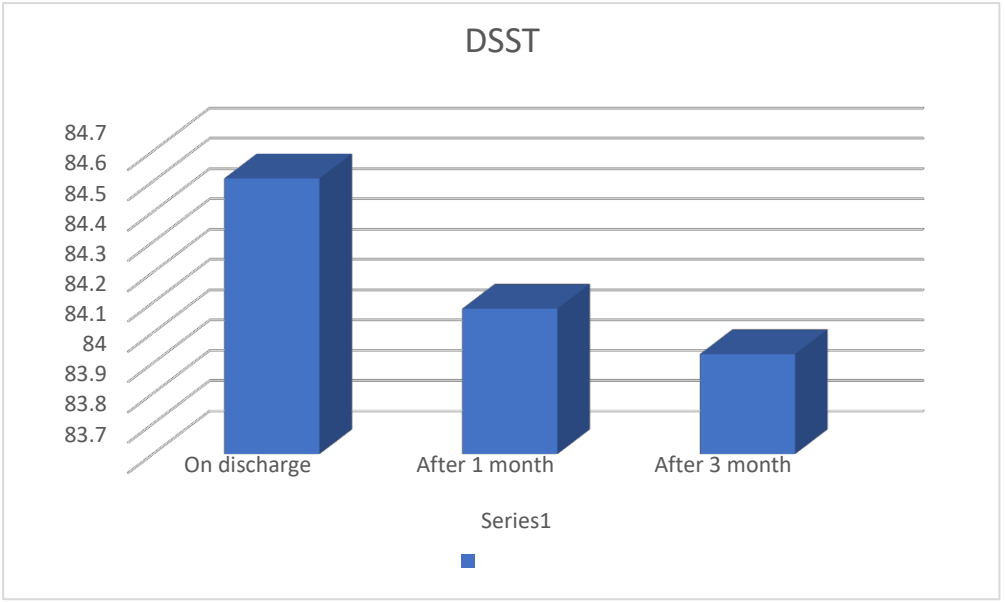
4.2 DIGIT SYMBOL SUBSTITUITON TEST(DSST):

In this DSST, we observed that the average score on discharge is 84.61, after one month is 84.18 and after three months is 84.03. The difference in means from the day of discharge to after one month and after three months is 0.43 and 0.58, respectively, which suggests that there is a subtle decrease in time taken by the subjects to finish the test. We found that with a p-value of 0.0001, it is statistically significant.

Table 18- DIGIT SYMBOL SUBSTITUITON TEST(DSST):

Parameters	DSST				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	84.61			3.092	43.000	0.0001*
After 1 month	84.18	0.43	0.51%	3.494		
After 3 month	84.03	0.58	0.68%	3.708		
*: Statistically significant						

Graphical Representation 18- DIGIT SYMBOL SUBSTITUITON TEST(DSST):



4.3 MINI-MENTAL STATE EXAMINATION (MMSE):

In this MMSE, we observed that the average score on discharge is 25.57, after one month is 25.17 and after three months is 25.04. The difference in means from the day of discharge to after one month and after three months is 0.4 and 0.53, respectively, which suggests that there is a subtle decrease in the score. We found that with a p-value of 0.0001, it is statistically significant.

Table 19- MINI-MENTAL STATE EXAMINATION (MMSE):

Parameters	MMSE				Friedman test	P value
	MEAN	Differences in the means	Difference in %	±SD		
On discharge	25.57			2.410	42.000	0.0001*
After 1 month	25.17	0.4	1.56%	3.251		
After 3 month	25.04	0.53	2.07%	3.566		
*: Statistically significant						

Graphical presentation- 19- MINI-MENTAL STATE EXAMINATION (MMSE):

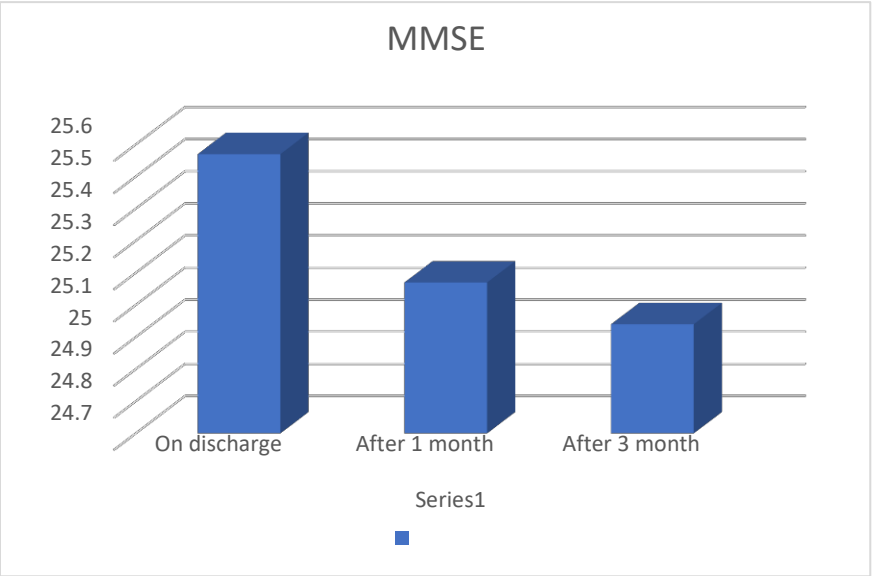


Table 20- Summary table

PARAMETERS	On discharge		After 1 month		After 3 month		Friedman test	P value
	MEAN	±SD	MEAN	±SD	MEAN	±SD		
TMT A	25.00	5.190	25.42	5.914	25.55	6.241	36.286	0.0001*
TMT B	57.16	12.848	57.54	13.576	57.66	13.836	42.000	0.0001*
PGI MEMORY	66.98	6.421	65.77	9.208	64.60	12.308	43.517	0.0001*
REMOTE MEMORY	7.00	0.000	6.90	0.304	6.78	0.678	42.000	0.0001*
RECENT MEMORY	5.00	0.000	4.90	0.304	4.77	0.680	43.000	0.0001*
MENTAL BALANCE	6.46	0.668	6.34	0.929	6.22	1.259	42.000	0.0001*
ATTENTION AND CONCENTRATION	7.91	1.320	7.75	1.601	7.62	1.905	42.000	0.0001
DELAYED RECALL	7.60	1.096	7.44	1.415	7.32	1.730	42.000	0.0001*
IMMEDIATE RECALL	5.57	1.025	5.45	1.186	5.33	1.468	36.940	0.0001*
VERBAL RETENTION FOR SIMILAR PAIRS	5.00	0.000	4.90	0.304	4.78	0.678	42.000	0.0001*
VERBAL RETENTION FOR DISSIMILAR PAIRS	10.14	1.235	9.99	1.500	9.81	1.604	40.095	0.0001*
VISUAL RETENTION	4.91	1.349	4.81	1.574	4.8	1.585	40.925	0.0001*
VISUAL RECOGNITION	7.39	1.384	7.29	1.572	7.17	1.858	41.518	0.0001*
MAZE TEST 1	11.80	2.411	12.11	3.206	12.23	3.550	42.000	0.0001*
MAZE TEST 2	15.11	3.495	15.57	4.244	15.69	4.541	40.000	0.0001*
DSST	84.61	3.092	84.18	3.494	84.03	3.708	43.000	0.0001*
MMSE	25.57	2.410	25.17	3.251	25.04	3.566	42.000	0.0001*

DISCUSSION:

Out of 205 patients enrolled In the study, 75 patients belonged to the age group of 40 to 49 years, followed by 67 patients in 50 to 60 years, 47 patients in the age group of 30 to 39 years,15 patients in 20 to 29 years, whereas only one patient was below 20 years, the mean age being 44.10± 9.64 years.

In Hampshire et al., a study from Germany, they did studies on large sample of 86,285 and the mean age group was 46.75±15.73 years[174].

In a study done by Shwetha Jakhmola et al.,in the year 2021, the age group of 20 to 49 years was more exposed to the virus in India.

In a study done by Hetong Zhou et al., in the year 2020 the mean age was 47± 10.54 years, which is almost similar to the results of our study[159].

In the study by Flavia Mattioli et al.,in the year 2021 the mean age was 47.76 years, the results of which are in accordance with the results of our study[160].

In contradiction to our study, the mean age was 74.5±3.8 years in a study done by Tiina Savikangas et al. ina year 2021[161].

In a other study by Jinghuan Gan et al.,in the year 2021, to study the impact of the COVID-19 pandemic on Alzheimer's disease and other dementias, the mean age was 70.62±7.96 years, the mean age was more than our study because they included the patients of Alzheimer's and other dementias and moreover in our study under exclusion criteria the age cut-off was 18 years to 60 years[162].

Gender distribution:

In our study, there was a male preponderance, with 147 males and 58 females ,probably because of more activity of males outdoors.

In a study done by Shwetha Jakhmola et al.,in the year 2021, the males were more exposed when compared to females because many of them serve in the society compared to the other age groups ,who stayed at home.Moreover,the COVID-19 mortatlity analysis

revealed a major population from India is in the age group 20 to 49 years compared to the other countries.Availability of adequate health facilities,access to health resources and detection of infection in developing countries than in the developed countries can be contributing factors . In the study done by Hetong Zhou et al., 62 % of the patients were males, while 38% Were females, which also had male preponderance[159].

In contrary to the results of our study, 75% of the patients were females in study by Flavia Mattioli[160] .

Psychological assessments:

TMT :

It was observed in our study that the average time taken to complete TMT-A at the time of discharge was 25 seconds where as an average time of 25.2 seconds was taken by the patients after one month of discharge, while the mean time taken was 25.55 after the three months of discharge. These results indicate that the time taken by the subjects to complete the test was increased after one month and three months, compared to the time of discharge, suggesting that there was a significant cognitive impairment, affecting the visual scanning and visuomotor tracking, thus affecting the speed of processing among COVID-19 recovered patients after a period of three months ($p<0.05$).

On evaluation with TMT-B,57.16 seconds was the average time taken to complete the test at the time of discharge, while the patients took 57.54 seconds on average after one month and 57.66 seconds after three months. It was found that there was a subtle increase in time taken by the subjects to complete the test at three months when compared to that at the time of discharge, and the association between the average time taken and the time period of evaluation was statistically significant. ($p<0.001$).

In a study done by Becker et al., in the year 2021 where he they used TMT A and B as one of the assessment methods and found that there was relatively higher rates of impairment in cognition were present after several months of COVID-19 recovery .Acccording to their

study defecits were present in executive functions and processing speed which were in accordance with our study[163]

Hetong zhou et al., in their study, found that the average time taken to complete the TMT was 47.82±16.55 seconds which was in accordance with our study[159].

In a study done by Adouni et al ., they found that the minimum and maximum time taken by the subjects to complete the TMT-A was 20 seconds and 309 seconds respectively where as the minimum and maximum time taken by the subjects to complete the TMT-B was 41 and 340 seconds respectively[164].

The results of our study indicate that the information processing speed of the subjects decreases following recovery from COVID-19 infection.

TMT is used commonly as a measure of Frontal Lobe functions like Executive functions which include Planning,Organising ,Sequencing and Multitasking.It is also a measure of behaviuoral difficulties like Agression ,Apathy and Disinhibition .

Therefore ,with the results we conclude that there is subtle decrease in the cognitive functions of Frontal Lobe in Executive functions.

PGI MEMORY SCALE(PGIMS):

To our knowledge, ours was the first study to determine cognitive impairment among COVID-19 recovered patients with the help of PGI MEMORY SCALE.

Remote memory, the subtest of the PGI MEMORY scale, was observed to decrease among COVID-19 recovered patients after three months of discharge when compared to the time of discharge. Although the mean scores were in the percentile range of 40 to 60, the level of remote memory being good according to the PGI MEMORY SCALE, the variations of mean scores within the percentile range was suggestive of cognitive decline in remote memory after three months of discharge which was statistically significant.

While the mean scores after one month and after three months differed from the time of discharge by 0.10 and 0.23, respectively, in the recent memory subset of PGI

MEMORY SCALE, the scores were in the range of 40 to 60, indicating a good level of recent memory according to PGI MEMORY SCALE despite being under the common percentile range there was a subtle decline in the cognitive function in recent memory which was statistically significant(p=0.001).

There was also a decline of average scores in the Mental balance subset of PGI MEMORY SCALE from 6.46 on the day of discharge to 6.34 at one month and 6.22 after three months of discharge. There was a decrease in cognitive function in the mental balance subset, with the average scores falling under low to very low levels of mental balance, according to PGI MEMORY SCALE. There was a statistically significant association between the level of mental balance and the time of evaluation with the PGI memory scale

In a study done by Becker et al., in the year 2021 along with the TMT A and B they also used assessments like Phonemic and Category fluency which test language , similarly in our study the assessment Mental balance does the same.According to their study, defecits were present in the Category fluency which is in accordance to our study[163].

Attention and concentration, the subtest of the PGI MEMORY scale, was observed to decrease among COVID-19 recovered patients after three months of discharge when compared to the time of discharge. Although the mean scores were in the percentile range of 0 to 20, the level of Attention and concentration being very low according to the PGI MEMORY SCALE, the variations of mean scores within the percentile range were suggestive of cognitive decline in Attention and concentration after three months of discharge which was statistically significant. (P=0.001).

In another subtest of the PGI MEMORY scale, the Delayed recall, the mean score on the day of discharge was 7.60,7.44 after one month and 7.32 after three months, the scores in the percentile range of 20 to 40 and 0 to 20, the level of delayed recall being low on the day of

discharge and the levels decreased to very low after three months according to the PGI MEMORY scale.

In a study done by Becker et al., in the year 2021 they also used assessments for Memory encoding and recall and they found that there were defecits in these areas[163].

The immediate recall subtest of the PGI memory scale showed a decline in the levels of cognitive function at three months after discharge compared to the time of discharge. The average mean score is 5.57 at discharge,5.45 after one month and 5.33 after three months.

The mean scores lie in the percentile range of 0 to 20, rendering a very low level of immediate recall, which was statistically significant (p=0.001).

While the mean scores after one month and after three months differed from the time of discharge by 0.1 and 0.22, respectively, in the verbal retention for similar pairs subtest of PGI MEMORY SCALE, the scores were in the range of 40 to 60, indicating a good level of verbal retention for similar pairs according to PGI MEMORY SCALE despite being under the common percentile range there was a subtle decline in the cognitive function in verbal retention for similar pairs which was statistically significant(p=0.001).

With a subjective mean score of 10.14 on the day of discharge,9.99 after one month and 9.81 after three months, the mean scores fell under the percentile range of 20 to 40, indicating a low level of verbal retention of dissimilar pairs according to PGI memory scale, also suggesting a cognitive decline after three months of discharge which was statistically significant.

Visual retention, the subtest of the PGI MEMORY scale, was observed to decrease among COVID-19 recovered patients after three months of discharge when compared to the time of discharge. Although the mean scores were in the percentile range of 0 to 20, the level of Visual retention is very low according to the PGI MEMORY SCALE. The variations of mean scores within the percentile range were suggestive of cognitive decline in Attention and concentration after three months of discharge which was statistically significant. (P=0.001).

In another subtest of the PGI memory scale, the visual recognition, the subjective mean score on the day of discharge was 7.39. After one month was 7.29 and after 3 months, is 7.17, the average score being in the percentile range of 0 to 20, indicating a very low level of visual recognition according to the PGI memory scale. There was a decline in the cognitive function among the COVID-19 recovered patients after three months of discharge which was statistically significant.

In a study done by Davis et al., in 2021 by using assessment methods like Qualtrics which contains 257 questions ,they also used MRI brain if memory or cognitive dysfunctions were present and foud that 88.0% of the study population showed Cognitive dysfunction and/or Memory loss [165].

In a study done by Junyoung Oh et al., in the year 2022,they found that SARS-COV-2 spike proteins can induce cognitive defecits and even causes anxiety like symptoms in the mouse by causing Hippocampal neuronal deaths which causes memory defecits as hippocampus is responsible for memory[166].

It is a comprehensive scale to measure Verbal and Non verbal memory which are the functions of Temporal Lobe.In our study we found that there was subtle decrease in the cognition in the domains of verbal and non verbal memory which suggest of Temporal lobe dysfunction.

MAZE TEST 1:

The average time taken to complete the maze test 1 was increased by 0.43 seconds at three months after discharge when compared to the day of discharge, and a difference of 0.31 seconds was observed between the first month of discharge and the time of discharge.

These results indicated that there was a cognitive dysfunction in the Visual memory and was statistically significant.

MAZE TEST 2:

The average time taken to complete maze test 2 was 15.11 seconds during discharge, compared to 15.57 seconds after one month of discharge and 15.69 seconds after three months of discharge.

The increase in time taken to complete the test after a period of three months suggest a cognitive dysfunction in COVID-19 recovered patients, which was statistically significant.

The maze test is used to assess the executive functions of the frontal lobe like planning, multitasking, organising sequence and impulse control. The results of our study indicate that the functions of the frontal lobe have been affected after three months following COVID-19 infection.

In a study done by Adouni et al .,the minimum and maximum time taken by the subjects to complete the Maze test was 7 seconds and 139 seconds respectively and the mean was 59 seconds this is because the mean age in the study was 63±12.7 which suggest that higher the age group the time taken to complete the test was high and the chances of cognitive defecits were also high[164].

Maze test is also a measure of Frontal Lobe where the Executive functions and Behaviuor changes can be identified .

In our study we found that there was with the help of Maze Test 1 and 2 ,there was subtle decline in the cognition in the domains related to the Frontal Lobe.

DSST:

DSST score was calculated as the number of correctly matched symbols in 120 seconds. In our study, the mean score on discharge was 84.61, whereas the average score after one month after discharge was 84.18 and 84.03 at three months of discharge.

Similar to the other tests done to determine cognitive dysfunction, DSST also showed declining cognitive function, which was also statistically significant.

In a study done by clement Gouraud et al., the mean DSST score was 50, which was lesser than the results of our study. The contrasting results might be due to the inclusion of elderly patients in their study, where the mean age was 60 years as opposed to the mean age of 44.10±9.64 years in our study[167].

DSST is a subtest of WAIS(Wechsler Adult Intelligence scale) to assess the psychomotor speed, sustained attention and logical reasoning and visuo perceptual the parameters that have been affected amongst the patients in our study following three months of COVID-19 infection.

MMSE:

The average MMSE score was 25.57 at the time of discharge,25.17 after one month of discharge and 25.04 after three months of discharge. Although there was a subtle decline in the scores, the mean score of 25 suggests no cognitive impairment. This could be attributed to the fact that MMSE helps to detect severe cognitive dysfunctions as that seen in neurodegenerative diseases. Hence there is no cognitive impairment among the patients enrolled in our study.

In a study by clement Goudaurd et al., the mean MMSE score was 28, which was also suggestive of no cognitive impairment, the results of which are in accordance with our study[167].

In another study by Flavia Mattioli et al., where the neurological and cognitive sequelae of COVID-19 patients were studied on a four-month follow-up, there was no cognitive impairment based on the MMSE score among the patients[160].

In another study by Jhinguan Gan et al., there was a severe cognitive impairment among the subjects enrolled, which is in contrast with the results in our study. The severe cognitive impairment could be attributed to the long-term follow-up of their patients compared to only three months of follow-up in our study[162].

In a Systematic review and Meta analysis study that is Impact of COVID-19 on Cognitive Function done by Sarah Houben in the year 2022 concluded that after COVID-19 infection the individuals are more prone to the Cognitive decline.According to this Meta analysis,MoCA was the assessment which was used most and found that it could mild cognitive defecits and

moreover MoCA is available in more than 100 languages. where as the next study which was used more frequently after the MoCA was MMSE.Among the both assessments MoCA could detect the subclinical defecits and can clearly discriminated when compared with MMSE[168].

In a study done by Woo et al., in the year 2020 by using Modified Telephone interview for cognitive status (TICS-M) found that subclinical sustatined cognitive decline may be a common complication in a COVID-19 recovered adults of younger age[169].

Alemanno et al., in a study done in 2021 using assessment methods like MoCA(Montreal Cognitive Assessment) and MMSE,concluded that 80% of the subjects showed cognitive impairment and 40% showed mild to moderate Depression[170].

In a study done by Amalakanti et al.,in 2021 using MoCA concluded that even asymptomatic COVID-19 patients had cognitive impairments which suggest that there is a requirement of detailed Neuropsychological assessment especially in a elderly population[171].

In a study done by Del Brutto et al., in 2021 using MoCA found that there was cognitive decline in a patients of mild COVID-19 infection[172].

In a study done by Dressing et al., in the year 2021 found that they could determine cognitive dysfunction after six months of COVID-19 infection ,neuronal causes could be the possible reason to the high prevalence of tiredness[173].

Hampshire et al., in the year 2021 by using Great British intelligence Test found that COVID-19 patients exhibited cognitive defecits when compared to controls.They also found that people who had been hopsitalized were having higher degree of cognitive defecits [174].

In a study by vyas et al., in the year 2021 used Brain Fog synptoms questionnaire and found that Brain fog can happen as a complication in COVID-19 survivors and it occurs in higher rates in patients who required oxygen and who were on Ventilator[175].

LIMITATIONS:

- In this study we have evaluated the immediate effects of SARS-CoV-2 infection on cognitive function , since the certain neuropsychological assessments were done only for a short period after the COVID-19 patients recovered.
- In this study we didn't use control group .
- In this study we didn't assess psychopathology.
- In this study we didn't correlate with the Neuroimaging
- Finally, we did not assess the influence of antiviral therapy and steroidal therapy on cognitive functions.

Conclusion:

In this study, most of the patients belong to the age group of 40 to 49 years, with male predominance. Several neuropsychological tests have been administered to determine the cognitive functions of recovered COVID-19 patients over a period of three months.

The average scores of TMT A and B, all the subtests of the PGI memory scale, Maze tests 1 and 2, and DSST showed a subtle decline in cognitive function after three months of recovery from COVID-19.

However, according to the MMSE score, there was no cognitive impairment among the patients, which could be due to the ability of MMSE to identify severe cognitive impairment when compared to other tests that could determine even a slight decrease in cognitive function.

Our study provided helpful insight into the effect of COVID-19 on neuropsychological manifestations in the affected patients. These findings also indicate that there will be an influx of patients in the near future with more cognitive dysfunctions. Hence any cognitive complaints after the episode of COVID-19 should be considered significant, and a long-term follow-up is necessary to identify the progress of the cognitive status, which could help in early intervention and prompt treatment.

In our study, though there was a cognitive decline, whether this cognitive dysfunction is transient or would progress was not established. Hence studies of larger magnitude and longer duration are required to assess the cognitive status of a COVID-19 recovered individual.

SUMMARY

1. Out of 205 patients enrolled In the study, 75 patients belonged to the age group of 40 to 49 years, followed by 67 patients in 50 to 60 years, 47 patients in the age group of 30 to 39 years,15 patients in 20 to 29 years, whereas only one patient was below 20 years, the mean age being 44.10± 9.64 years.
2. In our study, there was a male preponderance, with 147 males and 58 females ,probably because of more activity of males outdoors.
3. The males were more exposed when compared to females because many of them serve in the society compared to the other age groups ,who stayed at home.
4. TMT is used commonly as a measure of Frontal Lobe functions like Executive functions which include Planning, Organising ,Sequencing and Multitasking. Therefore,with the results we conclude that there is subtle decrease in the cognitive decline in the functions of Frontal Lobe in Executive functions.
5. To our knowledge, ours was the first study to determine cognitive impairment among COVID-19 recovered patients with the help of PGI MEMORY SCALE.
6. Remote memory, the subtest of the PGIMS, the variations of mean scores within the percentile range was suggestive of cognitive decline in remote memory after three months of discharge which was statistically significant.
7. While the mean scores after one month and after three months differed from the time of discharge , in the recent memory subset of PGIMS, indicating a good level of recent memory according to PGI MEMORY SCALE despite being under the common percentile range there was a subtle decline in the cognitive function in recent memory which was statistically significant($p=0.001$).
8. There was a decrease in cognitive function in the mental balance subset, with the average scores falling under low to very low levels of mental balance, according to PGI MEMORY

SCALE. There was a statistically significant association between the level of mental balance and the time of evaluation with the PGI memory scale.

9. Attention and concentration, the subtest of the PGI MEMORY scale, was observed to decrease among COVID-19 recovered patients after three months of discharge when compared to the time of discharge.
10. In another subtest of the PGI MEMORY scale, the Delayed recall, the levels decreased to very low after three months according to the PGI MEMORY scale.
11. The immediate recall subtest of the PGI memory scale showed a decline in the levels of cognitive function at three months after discharge compared to the time of discharge.
12. In the verbal retention for similar pairs subtest of PGI MEMORY SCALE, indicating a good level of verbal retention for similar pairs according to PGI MEMORY SCALE despite being under the common percentile range there was a subtle decline in the cognitive function in verbal retention for similar pairs which was statistically significant($p=0.001$).
13. Indicating a low level of verbal retention of dissimilar pairs according to PGI memory scale, also suggesting a cognitive decline after three months of discharge which was statistically significant.
14. Visual retention, the subtest of the PGI MEMORY scale, was observed to decrease among COVID-19 recovered patients after three months of discharge when compared to the time of discharge.
15. In another subtest of the PGI memory scale, the visual recognition, indicating a very low level of visual recognition according to the PGI memory scale. There was a decline in the cognitive function among the COVID-19 recovered patients after three months of discharge which was statistically significant.
16. PGIMS is a comprehensive scale to measure Verbal and Non-verbal memory which are the functions of Temporal Lobe. In our study we found that there was subtle decrease in the

cognition in the domains of verbal and non-verbal memory which suggest of Temporal lobe dysfunction.

17. The average time taken to complete the maze test 1 was increased these results indicated that there was a cognitive dysfunction in the Visual memory and was statistically significant.
18. The average time taken to complete maze test 2 was increased after a period of three months suggest a cognitive dysfunction in COVID-19 recovered patients, which was statistically significant.
19. The maze test is used to assess the executive functions of the frontal lobe like planning, multitasking, organising sequence and impulse control. The results of our study indicate that the functions of the frontal lobe have been affected after three months following COVID-19 infection.
20. Maze test is also a measure of Frontal Lobe where the Executive functions and Behaviour changes can be identified .
21. In our study we found that there was with the help of Maze Test 1 and 2 ,there was subtle decline in the cognition in the domains related to the Frontal Lobe.
22. Similar to the other tests done to determine cognitive dysfunction, DSST also showed declining cognitive function, which was also statistically significant.
23. DSST is a subtest of WAIS(Wechsler Adult Intelligence scale) to assess the psychomotor speed, sustained attention and logical reasoning and visuo perceptual the parameters that have been affected amongst the patients in our study following three months of COVID-19 infection.
24. Although there was a subtle decline in the scores of MMSE, the mean score of 25 suggests no cognitive impairment. This could be attributed to the fact that MMSE helps to detect severe cognitive dysfunctions as that seen in neurodegenerative diseases. Hence there is no cognitive impairment among the patients enrolled in our study according to the MMSE.

BIBILOGRAPHY:

1. Esakandari H, Nabi-Afjadi M, Fakkari-Afjadi J, Farahmandian N, Miresmaeili S-M, Bahreini E. A comprehensive review of COVID-19 characteristics. Biol Proced Online [Internet]. 2020 Dec 4;22(1):19. Available from: https://biologicalproceduresonline.biomedcentral.com/articles/10.1186/s12575-020-00128-2

2. Yu B, Li X, Chen J, Ouyang M, Zhang H, Zhao X, et al. Evaluation of variation in D-dimer levels among COVID-19 and bacterial pneumonia: a retrospective analysis. J Thromb Thrombolysis [Internet]. 2020 Oct 10;50(3):548–57. Available from: https://link.springer.com/10.1007/s11239-020-02171-y

3. Ozaslan M, Safdar M, Kilic IH, A. Khailan R. Practical Measures to Prevent COVID-19: A Mini-Review. J Biol Sci [Internet]. 2020 Mar 15;20(2):100–2. Available from: https://www.scialert.net/abstract/?doi=jbs.2020.100.102

4. Rajendran DK, Rajagopal V, Alagumanian S, Santhosh Kumar T, Sathiya Prabhakaran SP, Kasilingam D. Systematic literature review on novel coronavirus SARS-CoV-2: a threat to human era. VirusDisease [Internet]. 2020 Jun 11;31(2):161–73. Available from: https://link.springer.com/10.1007/s13337-020-00604-z

5. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet [Internet]. 2020 Feb;395(10223):507–13. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620302117

6. Adhikari SP, Meng S, Wu Y-J, Mao Y-P, Ye R-X, Wang Q-Z, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. Infect Dis Poverty [Internet]. 2020 Dec 17;9(1):29. Available from: https://idpjournal.biomedcentral.com/articles/10.1186/s40249-020-00646-x

7. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. N Engl J Med [Internet]. 2020 Mar 26;382(13):1199–207. Available from: http://www.nejm.org/doi/10.1056/NEJMoa2001316

8. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat Microbiol [Internet]. 2020 Apr 2;5(4):536–44. Available from: http://www.nature.com/articles/s41564-020-0695-z

9. Zhou P, Yang X-L, Wang X-G, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature [Internet]. 2020 Mar 12;579(7798):270–3. Available from: http://www.nature.com/articles/s41586-020-2012-7

10. World Health Organization Coronavirus. No Title [Internet]. Available from: World Health Organization Coronavirus

11. Kelso JK, Milne GJ, Kelly H. Simulation suggests that rapid activation of social distancing can arrest epidemic development due to a novel strain of influenza. BMC Public Health [Internet]. 2009 Dec 29;9(1):117. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-9-117

12. Vabret A, Mourez T, Dina J, van der Hoek L, Gouarin S, Petitjean J, et al. Human Coronavirus NL63, France. Emerg Infect Dis [Internet]. 2005 Aug;11(8):1225–9. Available from: http://wwwnc.cdc.gov/eid/article/11/8/05-0110_article.htm

13. Kahn JS, McIntosh K. History and Recent Advances in Coronavirus Discovery. Pediatr Infect Dis J [Internet]. 2005 Nov;24(11):S223–7. Available from: https://journals.lww.com/00006454-200511001-00012

14. Siddell SG, Anderson R, Cavanagh D, Fujiwara K, Klenk HD, Macnaughton MR, et al. Coronaviridae. Intervirology [Internet]. 1983;20(4):181–9. Available from: https://www.karger.com/Article/FullText/149390

15. Su S, Wong G, Shi W, Liu J, Lai ACK, Zhou J, et al. Epidemiology, Genetic Recombination, and Pathogenesis of Coronaviruses. Trends Microbiol [Internet]. 2016 Jun;24(6):490–502. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0966842X16000718

16. Types. C (2020) C coronavirus, CDC, Atlanta G. No Title. Available from: https://www.cdc.gov/coronavirus/types.html

17. Masters PS. The Molecular Biology of Coronaviruses. In 2006. p. 193–292. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0065352706660053

18. Wevers BA, van der Hoek L. Recently Discovered Human Coronaviruses. Clin Lab Med [Internet]. 2009 Dec;29(4):715–24. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0272271209000638

19. Gaunt ER, Hardie A, Claas ECJ, Simmonds P, Templeton KE. Epidemiology and Clinical Presentations of the Four Human Coronaviruses 229E, HKU1, NL63, and OC43 Detected over 3 Years Using a Novel Multiplex Real-Time PCR Method. J Clin Microbiol [Internet]. 2010 Aug;48(8):2940–7. Available from: https://journals.asm.org/doi/10.1128/JCM.00636-10

20. Delamater PL, Street EJ, Leslie TF, Yang YT, Jacobsen KH. Complexity of the Basic Reproduction Number (R 0). Emerg Infect Dis [Internet]. 2019 Jan;25(1):1–4. Available from: http://wwwnc.cdc.gov/eid/article/25/1/17-1901_article.htm

21. van den Driessche P, Watmough J. Further Notes on the Basic Reproduction Number. In 2008. p. 159–78. Available from: http://link.springer.com/10.1007/978-3-540-78911-6_6

22. Andreasen V. The Final Size of an Epidemic and Its Relation to the Basic Reproduction Number. Bull Math Biol [Internet]. 2011 Oct 6;73(10):2305–21. Available from: http://link.springer.com/10.1007/s11538-010-9623-3

23. Dietz K. The estimation of the basic reproduction number for infectious diseases. Stat

Methods Med Res [Internet]. 1993 Mar 2;2(1):23–41. Available from: http://journals.sagepub.com/doi/10.1177/096228029300200103

24. Xu R-H, He J-F, Evans MR, Peng G-W, Field HE, Yu D-W, et al. Epidemiologic Clues to SARS Origin in China. Emerg Infect Dis [Internet]. 2004 Jun;10(6):1030–7. Available from: http://wwwnc.cdc.gov/eid/article/10/6/03-0852_article.htm

25. Sheet SBF. No Title. Available from: https://www.cdc.gov/sars/about/fs-sars.html

26. Breugelmans JG, Zucs P, Porten K, Broll S, Niedrig M, Ammon A, et al. SARS Transmission and Commercial Aircraft. Emerg Infect Dis [Internet]. 2004 Aug;10(8):1502–3. Available from: http://wwwnc.cdc.gov/eid/article/10/8/04-0093_article.htm

27. Peiris J, Lai S, Poon L, Guan Y, Yam L, Lim W, et al. Coronavirus as a possible cause of severe acute respiratory syndrome. Lancet [Internet]. 2003 Apr;361(9366):1319–25. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673603130772

28. Bolles M, Donaldson E, Baric R. SARS-CoV and emergent coronaviruses: viral determinants of interspecies transmission. Curr Opin Virol [Internet]. 2011 Dec;1(6):624–34. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1879625711001313

29. Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R. SARS Control and Psychological Effects of Quarantine, Toronto, Canada. Emerg Infect Dis [Internet]. 2004 Jul;10(7):1206–12. Available from: http://wwwnc.cdc.gov/eid/article/10/7/03-0703_article.htm

30. Du L, Yang Y, Zhou Y, Lu L, Li F, Jiang S. MERS-CoV spike protein: a key target for antivirals. Expert Opin Ther Targets [Internet]. 2017 Feb 21;21(2):131–43. Available from: https://www.tandfonline.com/doi/full/10.1080/14728222.2017.1271415

31. Killerby ME, Biggs HM, Midgley CM, Gerber SI, Watson JT. Middle East Respiratory Syndrome Coronavirus Transmission. Emerg Infect Dis [Internet]. 2020 Feb;26(2):191–

8. Available from: http://wwwnc.cdc.gov/eid/article/26/2/19-0697_article.htm

32. The, World Health Organization Regional Office for MERS, Eastern MediterraneanWHO EMRO | Outbreaks.

33. Nowotny N, Kolodziejek J. Middle East respiratory syndrome coronavirus (MERS-CoV) in dromedary camels, Oman, 2013. Eurosurveillance [Internet]. 2014 Apr 24;19(16). Available from: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES2014.19.16.20781

34. Ahmed AE. Estimating survival rates in MERS-CoV patients 14 and 45 days after experiencing symptoms and determining the differences in survival rates by demographic data, disease characteristics and regions: a worldwide study. Epidemiol Infect [Internet]. 2018 Mar 22;146(4):489–95. Available from: https://www.cambridge.org/core/product/identifier/S095026881700293X/type/journal_article

35. Zumla A, Hui DS, Perlman S. Middle East respiratory syndrome. Lancet [Internet]. 2015 Sep;386(9997):995–1007. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673615604548

36. CDC (2020) International locations with confirmedCOVID-19 cases. Centers for Disease Control andPrevention, Atlanta,. Cdc. 2020;

37. Worldometer. Coronavirus Update (Live): Cases and Deaths from COVID-19 Virus Pandemic. Worldometers [Internet]. 2021;1. Available from: https://www.worldometers.info/coronavirus

38. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. J Autoimmun [Internet]. 2020 May;109:102433. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0896841120300469

39. Kheirallah K, Alsinglawi B, Alzoubi A, Saidan M, Mubin O, Alorjani M, et al. The Effect of Strict State Measures on the Epidemiologic Curve of COVID-19 Infection in

the Context of a Developing Country: A Simulation From Jordan. 2020.

40. Suparyanto dan Rosad (2015. 済無No Title No Title No Title. Suparyanto dan Rosad (2015 [Internet]. 2020;5(3):248–53. Available from: https://www.who.int/emergencies/diseases/nove%0Al-coronavirus-2019/situation-reports

41. Riou J, Althaus CL. Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. Eurosurveillance [Internet]. 2020 Jan 30;25(4). Available from: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.4.2000058

42. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients. N Engl J Med [Internet]. 2020 Mar 19;382(12):1177–9. Available from: http://www.nejm.org/doi/10.1056/NEJMc2001737

43. Garg S, Kim L, Whitaker M, O'Halloran A, Cummings C, Holstein R, et al. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020. MMWR Morb Mortal Wkly Rep [Internet]. 2020 Apr 17;69(15):458–64. Available from: http://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm?s_cid=mm6915e3_w

44. Michelen M, Jones N, Stavropoulou C. In patients of COVID-19, what are the symptoms and clinical features of mild and moderate cases? - The Centre for Evidence-Based Medicine. Cent Evidence-Based Med [Internet]. 2020; Available from: https://www.cebm.net/COVID-19/in-patients-of-COVID-19-what-are-the-symptoms-and-clinical-features-of-mild-and-moderate-case/

45. Auwaerter M.D. P. Coronavirus COVID-19 (SARS-CoV-2) [Internet]. The Johns Hopkins University; 2022. Available from:

https://www.hopkinsguides.com/hopkins/view/Johns_Hopkins_ABX_Guide/540747/all/Coronavirus_COVID_19__SARS_CoV_2_

46. Verity R, Okell LC, Dorigatti I, Winskill P, Whittaker C, Imai N, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. Lancet Infect Dis [Internet]. 2020 Jun;20(6):669–77. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1473309920302437

47. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med [Internet]. 2020 May;8(5):475–81. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2213260020300795

48. Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, et al. COVID-19 in Critically Ill Patients in the Seattle Region — Case Series. N Engl J Med [Internet]. 2020 May 21;382(21):2012–22. Available from: http://www.nejm.org/doi/10.1056/NEJMoa2004500

49. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet [Internet]. 2020 Feb;395(10223):497–506. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620301835

50. Gattinoni L, Chiumello D, Caironi P, Busana M, Romitti F, Brazzi L, et al. COVID-19 pneumonia: different respiratory treatments for different phenotypes? Intensive Care Med [Internet]. 2020 Jun 14;46(6):1099–102. Available from: https://link.springer.com/10.1007/s00134-020-06033-2

51. Gattinoni L, Quintel M, Marini JJ. “Less is More” in mechanical ventilation. Intensive Care Med [Internet]. 2020;46(4):780–2. Available from: https://doi.org/10.1007/s00134-020-05981-z

52. Young PJ, Bailey MJ, Bass F, Beasley RW, Freebairn RC, Hammond NE, et al.

Randomised evaluation of active control of temperature versus ordinary temperature management (REACTOR) trial. Intensive Care Med [Internet]. 2019 Oct 1;45(10):1382–91. Available from: http://link.springer.com/10.1007/s00134-019-05729-4

53. Ryan M, Levy MM. Clinical review: fever in intensive care unit patients. Crit Care. 2003 Jun;7(3):221–5.

54. Hu Z, Song C, Xu C, Jin G, Chen Y, Xu X, et al. Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. Sci China Life Sci [Internet]. 2020 May 4;63(5):706–11. Available from: http://link.springer.com/10.1007/s11427-020-1661-4

55. Lewnard JA, Lo NC. Scientific and ethical basis for social-distancing interventions against COVID-19. Lancet Infect Dis [Internet]. 2020 Jun;20(6):631–3. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1473309920301900

56. Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet [Internet]. 2020 Mar;395(10228):931–4. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620305675

57. Onder G, Rezza G, Brusaferro S. Case-Fatality Rate and Characteristics of Patients Dying in Relation to COVID-19 in Italy. JAMA [Internet]. 2020 Mar 23; Available from: https://jamanetwork.com/journals/jama/fullarticle/2763667

58. CDC People who are at higher risk for severe illness.CDC, Atlanta, GA.

59. Poltronieri P, Sun B, Mallardo M. RNA Viruses: RNA Roles in Pathogenesis, Coreplication and Viral Load. Curr Genomics [Internet]. 2015 Jul 10;16(5):327–35. Available from: http://www.eurekaselect.com/openurl/content.php?genre=article&issn=1389-2029&volume=16&issue=5&spage=327

60. Hoffmann M, Kleine-Weber H, Schroeder S, Krüger N, Herrler T, Erichsen S, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. Cell [Internet]. 2020 Apr;181(2):271-280.e8. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0092867420302294

61. Fehr AR, Perlman S. Coronaviruses: An Overview of Their Replication and Pathogenesis. In 2015. p. 1–23. Available from: http://link.springer.com/10.1007/978-1-4939-2438-7_1

62. Frieman M, Baric R. Mechanisms of Severe Acute Respiratory Syndrome Pathogenesis and Innate Immunomodulation. Microbiol Mol Biol Rev [Internet]. 2008 Dec;72(4):672–85. Available from: https://journals.asm.org/doi/10.1128/MMBR.00015-08

63. Astuti I, Ysrafil. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): An overview of viral structure and host response. Diabetes Metab Syndr Clin Res Rev [Internet]. 2020 Jul;14(4):407–12. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1871402120300849

64. Walls AC, Park Y-J, Tortorici MA, Wall A, McGuire AT, Veesler D. Structure, Function, and Antigenicity of the SARS-CoV-2 Spike Glycoprotein. Cell [Internet]. 2020 Apr;181(2):281-292.e6. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0092867420302622

65. Yan R, Zhang Y, Li Y, Xia L, Guo Y, Zhou Q. Structural basis for the recognition of SARS-CoV-2 by full-length human ACE2. Science (80-) [Internet]. 2020 Mar 27;367(6485):1444–8. Available from: https://www.science.org/doi/10.1126/science.abb2762

66. KUBA K, IMAI Y, PENNINGER J. Angiotensin-converting enzyme 2 in lung diseases. Curr Opin Pharmacol [Internet]. 2006 Jun;6(3):271–6. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1471489206000579

67. Li F. Receptor Recognition Mechanisms of Coronaviruses: a Decade of Structural Studies. Goff SP, editor. J Virol [Internet]. 2015 Feb 15;89(4):1954–64. Available from: https://journals.asm.org/doi/10.1128/JVI.02615-14

68. Verdecchia P, Cavallini C, Spanevello A, Angeli F. The pivotal link between ACE2 deficiency and SARS-CoV-2 infection. Eur J Intern Med [Internet]. 2020 Jun;76:14–20. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0953620520301515

69. Wrapp D, Wang N, Corbett KS, Goldsmith JA, Hsieh C-L, Abiona O, et al. Cryo-EM structure of the 2019-nCoV spike in the prefusion conformation. Science (80-) [Internet]. 2020 Mar 13;367(6483):1260–3. Available from: https://www.science.org/doi/10.1126/science.abb2507

70. He J, Tao H, Yan Y, Huang S-Y, Xiao Y. Molecular Mechanism of Evolution and Human Infection with SARS-CoV-2. Viruses [Internet]. 2020 Apr 10;12(4):428. Available from: https://www.mdpi.com/1999-4915/12/4/428

71. Qiu Y, Zhao Y-B, Wang Q, Li J-Y, Zhou Z-J, Liao C-H, et al. Predicting the angiotensin converting enzyme 2 (ACE2) utilizing capability as the receptor of SARS-CoV-2. Microbes Infect [Internet]. 2020 May;22(4–5):221–5. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1286457920300496

72. Xia S, Liu M, Wang C, Xu W, Lan Q, Feng S, et al. Inhibition of SARS-CoV-2 (previously 2019-nCoV) infection by a highly potent pan-coronavirus fusion inhibitor targeting its spike protein that harbors a high capacity to mediate membrane fusion. Cell Res [Internet]. 2020 Apr 30;30(4):343–55. Available from: http://www.nature.com/articles/s41422-020-0305-x

73. Gao J, Lu G, Qi J, Li Y, Wu Y, Deng Y, et al. Structure of the Fusion Core and Inhibition of Fusion by a Heptad Repeat Peptide Derived from the S Protein of Middle East Respiratory Syndrome Coronavirus. J Virol [Internet]. 2013 Dec 15;87(24):13134–40. Available from: https://journals.asm.org/doi/10.1128/JVI.02433-13

74. Burkard C, Verheije MH, Wicht O, van Kasteren SI, van Kuppeveld FJ, Haagmans BL, et al. Coronavirus Cell Entry Occurs through the Endo-/Lysosomal Pathway in a Proteolysis-Dependent Manner. Perlman S, editor. PLoS Pathog [Internet]. 2014 Nov 6;10(11):e1004502. Available from: https://dx.plos.org/10.1371/journal.ppat.1004502

75. Shirato K, Kawase M, Matsuyama S. Wild-type human coronaviruses prefer cell-surface TMPRSS2 to endosomal cathepsins for cell entry. Virology [Internet]. 2018 Apr;517:9–15. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0042682217303914

76. Guo Y-R, Cao Q-D, Hong Z-S, Tan Y-Y, Chen S-D, Jin H-J, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – an update on the status. Mil Med Res [Internet]. 2020 Dec 13;7(1):11. Available from: https://mmrjournal.biomedcentral.com/articles/10.1186/s40779-020-00240-0

77. CDC. Coronavirus Disease 2019 (COVID-19) [Internet]. Centers for Disease Control and Prevention, 2021. Available from: https://www.cdc.gov/coronavirus/2019-ncov/lab/guidelines-clinical-specimens.html

78. Blocken B, Malizia F, van Druenen T, Marchal T. Towards aerodynamically equivalent COVID19 1.5 m social distancing for walking and running. Urban Phys [Internet]. 2020;11. Available from: http://www.urbanphysics.net/Social Distancing v20_White_Paper.pdf

79. Bridge JA. Reverse transcription-polymerase chain reaction molecular testing of cytology specimens: Pre-analytic and analytic factors. Cancer Cytopathol [Internet]. 2017 Jan;125(1):11–9. Available from: https://onlinelibrary.wiley.com/doi/10.1002/cncy.21762

80. Konrad R, Eberle U, Dangel A, Treis B, Berger A, Bengs K, et al. Rapid establishment of laboratory diagnostics for the novel coronavirus SARS-CoV-2 in Bavaria, Germany, February 2020. Eurosurveillance [Internet]. 2020 Mar 5;25(9). Available from: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.9.2000173

81. Delli Compagni E, Jurisic L, Caporale M, Bacà F, Scialabba S, Fanì S, et al. Genome Sequences of Three SARS-CoV-2 P.1 Strains Identified from Patients Returning from Brazil to Italy. Roux S, editor. Microbiol Resour Announc [Internet]. 2021 Mar 25;10(12). Available from: https://journals.asm.org/doi/10.1128/MRA.00177-21

82. Freeman WM, Walker SJ, Vrana KE. Quantitative RT-PCR: Pitfalls and Potential. Biotechniques [Internet]. 1999 Jan;26(1):112–25. Available from: https://www.future-science.com/doi/10.2144/99261rv01

83. Romsos EL, Vallone PM. Rapid PCR of STR markers: Applications to human identification. Forensic Sci Int Genet [Internet]. 2015 Sep;18:90–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1872497315000782

84. Raeisossadati MJ, Danesh NM, Borna F, Gholamzad M, Ramezani M, Abnous K, et al. Lateral flow based immunobiosensors for detection of food contaminants. Biosens Bioelectron [Internet]. 2016 Dec;86:235–46. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0956566316305930

85. ABBOTT. Abbott Launches COVID-19 Antibody Test. 2020; Available from: https://www.abbott.com/corpnewsroom/diagnostics-testing/abbott-launches-COVID-19-antibody-test.html

86. Roche. Roche's COVID-19 antibody test receives FDA Emergency Use Authorization and is available in markets accepting the CE mark. Https://WwwRocheCom/Dam/Jcr:409Cf75C-a33a-48F8-8a48-C7D9a71Fcfab/En/03052020-Rochemediareleae-Elecsys-Covid19Pdf [Internet]. 2020;1–3. Available from: https://www.roche.com/media/releases/med-cor-2020-05-03.htm

87. Perera RA, Mok CK, Tsang OT, Lv H, Ko RL, Wu NC, et al. Serological assays for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), March 2020. Eurosurveillance [Internet]. 2020 Apr 23;25(16). Available from:

https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.16.2000421

88. Infantino M, Damiani A, Gobbi FL, Grossi V, Lari B, Macchia D, et al. Serological Assays for SARS-CoV-2 Infectious Disease: Benefits, Limitations and Perspectives. Isr Med Assoc J [Internet]. 2020 Apr;22(4):203–10. Available from: http://www.ncbi.nlm.nih.gov/pubmed/32286019

89. Amanat F, Stadlbauer D, Strohmeier S, Nguyen THO, Chromikova V, McMahon M, et al. A serological assay to detect SARS-CoV-2 seroconversion in humans. Nat Med [Internet]. 2020 Jul 12;26(7):1033–6. Available from: http://www.nature.com/articles/s41591-020-0913-5

90. Vidyasagar A (2018) What is CRISPR? Available from: https://www.livescience.com/58790-%0Acrispr-explained.html

91. Zhang F, Abudayyeh OO & Gootenberg JS. A protocol for detection of COVID-19 using CRISPR diagnostics. Available from: https://www.broadinstitute.org/files/%0Apublications/special/COVID-19 detection (upda%0Ated).pdf

92. Chen JS, Ma E, Harrington LB, Da Costa M, Tian X, Palefsky JM, et al. CRISPR-Cas12a target binding unleashes indiscriminate single-stranded DNase activity. Science (80-) [Internet]. 2018 Apr 27;360(6387):436–9. Available from: https://www.science.org/doi/10.1126/science.aar6245

93. Yang F, Zhao H, Liu H, Wu X, Li Y. Manifestations and mechanisms of central nervous system damage caused by SARS-CoV-2. Brain Res Bull [Internet]. 2021 Dec;177:155–63. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0361923021002847

94. Alenina N, Bader M. ACE2 in Brain Physiology and Pathophysiology: Evidence from Transgenic Animal Models. Neurochem Res [Internet]. 2019 Jun 15;44(6):1323–9. Available from: http://link.springer.com/10.1007/s11064-018-2679-4

95. Baig AM, Khaleeq A, Ali U, Syeda H. Evidence of the COVID-19 Virus Targeting the

CNS: Tissue Distribution, Host–Virus Interaction, and Proposed Neurotropic Mechanisms. ACS Chem Neurosci [Internet]. 2020 Apr 1;11(7):995–8. Available from: https://pubs.acs.org/doi/10.1021/acschemneuro.0c00122

96. Fisicaro F, Di Napoli M, Liberto A, Fanella M, Di Stasio F, Pennisi M, et al. Neurological Sequelae in Patients with COVID-19: A Histopathological Perspective. Int J Environ Res Public Health [Internet]. 2021 Feb 3;18(4):1415. Available from: https://www.mdpi.com/1660-4601/18/4/1415

97. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. N Engl J Med [Internet]. 2020 Apr 30;382(18):1708–20. Available from: http://www.nejm.org/doi/10.1056/NEJMoa2002032

98. Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. JAMA Neurol [Internet]. 2020 Jun 1;77(6):683. Available from: https://jamanetwork.com/journals/jamaneurology/fullarticle/2764549

99. Jin X, Lian J-S, Hu J-H, Gao J, Zheng L, Zhang Y-M, et al. Epidemiological, clinical and virological characteristics of 74 cases of coronavirus-infected disease 2019 (COVID-19) with gastrointestinal symptoms. Gut [Internet]. 2020 Jun 1;69(6):1002 LP – 1009. Available from: http://gut.bmj.com/content/69/6/1002.abstract

100. Rodriguez-Morales AJ, Cardona-Ospina JA, Gutiérrez-Ocampo E, Villamizar-Peña R, Holguin-Rivera Y, Escalera-Antezana JP, et al. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. Travel Med Infect Dis. 2020;34:101623.

101. Wang C, Fei D, Li X, Zhao M, Yu K. IL-6 may be a good biomarker for earlier detection of COVID-19 progression. Intensive Care Med [Internet]. 2020;46(7):1475–6. Available from: https://doi.org/10.1007/s00134-020-06065-8

102. Ye Q, Wang B, Mao J. The pathogenesis and treatment of theCytokine Storm'in

COVID-19. J Infect. 2020;80(6):607–13.

103. Mak PQ, Chung K-S, Wong JS-C, Shek C-C, Kwan MY-W. Anosmia and Ageusia: Not an Uncommon Presentation of COVID-19 Infection in Children and Adolescents. Pediatr Infect Dis J [Internet]. 2020 Aug 13;39(8):e199–200. Available from: https://journals.lww.com/10.1097/INF.0000000000002718

104. Poyiadji N, Shahin G, Noujaim D, Stone M, Patel SC, Griffith B. COVID-19-associated acute hemorrhagic necrotizing encephalopathy: imaging features. Radiology. 2020;296(2):119.

105. Ghannam M, Alshaer Q, Al-Chalabi M, Zakarna L, Robertson J, Manousakis G. Neurological involvement of coronavirus disease 2019: a systematic review. J Neurol. 2020;267(11):3135–53.

106. Benameur K, Agarwal A, Auld SC, Butters MP, Webster AS, Ozturk T, et al. Encephalopathy and encephalitis associated with cerebrospinal fluid cytokine alterations and coronavirus disease, Atlanta, Georgia, USA, 2020. Emerg Infect Dis. 2020;26(9):2016.

107. Dixon L, Varley J, Gontsarova A, Mallon D, Tona F, Muir D, et al. COVID-19-related acute necrotizing encephalopathy with brain stem involvement in a patient with aplastic anemia. Neurol Neuroinflammation. 2020;7(5).

108. Frontera JA, Sabadia S, Lalchan R, Fang T, Flusty B, Millar-Vernetti P, et al. A Prospective Study of Neurologic Disorders in Hospitalized Patients With COVID-19 in New York City. Neurology [Internet]. 2021 Jan 26;96(4):e575 LP-e586. Available from: http://n.neurology.org/content/96/4/e575.abstract

109. Pilotto A, Odolini S, Masciocchi S, Comelli A, Volonghi I, Gazzina S, et al. Steroid-Responsive Encephalitis in Coronavirus Disease 2019. Ann Neurol [Internet]. 2020 Aug 9;88(2):423–7. Available from: https://onlinelibrary.wiley.com/doi/10.1002/ana.25783

110. Oxley TJ, Mocco J, Majidi S, Kellner CP, Shoirah H, Singh IP, et al. Large-vessel stroke

as a presenting feature of COVID-19 in the young. N Engl J Med. 2020;382(20):e60.

111. Ji H-L, Zhao R, Matalon S, Matthay MA. Elevated Plasmin(ogen) as a Common Risk Factor for COVID-19 Susceptibility. Physiol Rev [Internet]. 2020 Jul 1;100(3):1065–75. Available from: https://journals.physiology.org/doi/10.1152/physrev.00013.2020

112. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet [Internet]. 2020 Mar;395(10229):1054–62. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620305663

113. Wang Y, Wang Y, Chen Y, Qin Q. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. J Med Virol. 2020;92(6):568–76.

114. Huang YH, Jiang D, Huang JT. SARS-CoV-2 detected in cerebrospinal fluid by PCR in a case of COVID-19 encephalitis. Brain Behav Immun. 2020;87:149.

115. Song E, Zhang C, Israelow B, Lu-Culligan A, Prado AV, Skriabine S, et al. Neuroinvasion of SARS-CoV-2 in human and mouse brain. J Exp Med. 2021;218(3).

116. Desforges M, Le Coupanec A, Dubeau P, Bourgouin A, Lajoie L, Dubé M, et al. Human coronaviruses and other respiratory viruses: underestimated opportunistic pathogens of the central nervous system? Viruses. 2019;12(1):14.

117. Zubair AS, McAlpine LS, Gardin T, Farhadian S, Kuruvilla DE, Spudich S. Neuropathogenesis and Neurologic Manifestations of the Coronaviruses in the Age of Coronavirus Disease 2019. JAMA Neurol [Internet]. 2020 Aug 1;77(8):1018. Available from: https://jamanetwork.com/journals/jamaneurology/fullarticle/2766766

118. Leite APD, Carnevale LB, Rocha HL da, Pereira CA, Filho L de L. Relação entre autoavaliação vocal e dados da avaliação clínica em indivíduos disfônicos. Rev CEFAC [Internet]. 2015 Feb;17(1):44–51. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-

18462015000100044&lng=pt&tlng=pt

119. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. JAMA [Internet]. 2020 Apr 7;323(13):1239. Available from: https://jamanetwork.com/journals/jama/fullarticle/2762130

120. Bohmwald K, Gálvez NMS, Ríos M, Kalergis AM. Neurologic Alterations Due to Respiratory Virus Infections. Front Cell Neurosci [Internet]. 2018 Oct 26;12. Available from: https://www.frontiersin.org/article/10.3389/fncel.2018.00386/full

121. Meinhardt J, Radke J, Dittmayer C, Franz J, Thomas C, Mothes R, et al. Olfactory transmucosal SARS-CoV-2 invasion as a port of central nervous system entry in individuals with COVID-19. Nat Neurosci [Internet]. 2021 Feb;24(2):168–75. Available from: http://www.nature.com/articles/s41593-020-00758-5

122. van Riel D, Verdijk R, Kuiken T. The olfactory nerve: a shortcut for influenza and other viral diseases into the central nervous system. J Pathol [Internet]. 2015 Jan;235(2):277–87. Available from: https://onlinelibrary.wiley.com/doi/10.1002/path.4461

123. Lemprière S. SARS-CoV-2 detected in olfactory neurons. Nat Rev Neurol [Internet]. 2021 Feb 4;17(2):63–63. Available from: http://www.nature.com/articles/s41582-020-00449-6

124. Berth SH, Leopold PL, Morfini G. Virus-induced neuronal dysfunction and degeneration. Front Biosci. 2009;14(14):5239–59.

125. Heneka MT, Golenbock D, Latz E, Morgan D, Brown R. Immediate and long-term consequences of COVID-19 infections for the development of neurological disease. Alzheimers Res Ther [Internet]. 2020 Dec 4;12(1):69. Available from: https://alzres.biomedcentral.com/articles/10.1186/s13195-020-00640-3

126. Fu Y, Cheng Y, Wu Y. Understanding SARS-CoV-2-Mediated Inflammatory Responses: From Mechanisms to Potential Therapeutic Tools. Virol Sin [Internet].

2020;35(3):266–71. Available from: https://doi.org/10.1007/s12250-020-00207-4

127. Mazzoni A, Salvati L, Maggi L, Capone M, Vanni A, Spinicci M, et al. Impaired immune cell cytotoxicity in severe COVID-19 is IL-6 dependent. J Clin Invest. 2020;130(9):4694–703.

128. Zhang X, Tan Y, Ling Y, Lu G, Liu F, Yi Z, et al. Viral and host factors related to the clinical outcome of COVID-19. Nature [Internet]. 2020;583(7816):437–40. Available from: https://doi.org/10.1038/s41586-020-2355-0

129. Blanco-Melo D, Nilsson-Payant BE, Liu W-C, Uhl S, Hoagland D, Møller R, et al. Imbalanced Host Response to SARS-CoV-2 Drives Development of COVID-19. Cell. 2020 May;181(5):1036-1045.e9.

130. Kempuraj D, Selvakumar GP, Ahmed ME, Raikwar SP, Thangavel R, Khan A, et al. COVID-19, Mast Cells, Cytokine Storm, Psychological Stress, and Neuroinflammation. Neurosci [Internet]. 2020 Oct 18;26(5–6):402–14. Available from: http://journals.sagepub.com/doi/10.1177/1073858420941476

131. Dhamoon MS, Thaler A, Gururangan K, Kohli A, Sisniega D, Wheelwright D, et al. Acute Cerebrovascular Events With COVID-19 Infection. Stroke [Internet]. 2021 Jan;52(1):48–56. Available from: https://www.ahajournals.org/doi/10.1161/STROKEAHA.120.031668

132. Klok FA, Kruip M, Van der Meer NJM, Arbous MS, Gommers D, Kant KM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. Thromb Res. 2020;191:145–7.

133. Hess DC, Eldahshan W, Rutkowski E. COVID-19-Related Stroke. Transl Stroke Res [Internet]. 2020 Jun 7;11(3):322–5. Available from: https://link.springer.com/10.1007/s12975-020-00818-9

134. Iba T, Levy JH, Warkentin TE, Thachil J, van der Poll T, Levi M, et al. Diagnosis and management of sepsis-induced coagulopathy and disseminated intravascular

coagulation. J Thromb Haemost. 2019;17(11):1989–94.

135. Liao D, Zhou F, Luo L, Xu M, Wang H, Xia J, et al. Haematological characteristics and risk factors in the classification and prognosis evaluation of COVID-19: a retrospective cohort study. Lancet Haematol. 2020;7(9):e671–8.

136. von Weyhern CH, Kaufmann I, Neff F, Kremer M. Early evidence of pronounced brain involvement in fatal COVID-19 outcomes. Lancet. 2020;395(10241):e109.

137. Zhang Y, Xiao M, Zhang S, Xia P, Cao W, Jiang W, et al. Coagulopathy and antiphospholipid antibodies in patients with COVID-19. N Engl J Med. 2020;382(17):e38.

138. Gheblawi M, Wang K, Viveiros A, Nguyen Q, Zhong J-C, Turner AJ, et al. Angiotensin-Converting Enzyme 2: SARS-CoV-2 Receptor and Regulator of the Renin-Angiotensin System. Circ Res [Internet]. 2020 May 8;126(10):1456–74. Available from: https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.120.317015

139. Xu J, Lazartigues E. Expression of ACE2 in Human Neurons Supports the Neuro-Invasive Potential of COVID-19 Virus. Cell Mol Neurobiol. 2022 Jan;42(1):305–9.

140. Sun S-H, Chen Q, Gu H-J, Yang G, Wang Y-X, Huang X-Y, et al. A mouse model of SARS-CoV-2 infection and pathogenesis. Cell Host Microbe. 2020;28(1):124–33.

141. Nath A. Neurologic complications of coronavirus infections. Neurology [Internet]. 2020 May 12;94(19):809–10. Available from: https://www.neurology.org/lookup/doi/10.1212/WNL.0000000000009455

142. Miners S, Kehoe PG, Love S. Cognitive impact of COVID-19: looking beyond the short term. Alzheimers Res Ther [Internet]. 2020 Dec 30;12(1):170. Available from: https://alzres.biomedcentral.com/articles/10.1186/s13195-020-00744-w

143. Ellul MA, Benjamin L, Singh B, Lant S, Michael BD, Easton A, et al. Neurological associations of COVID-19. Lancet Neurol [Internet]. 2020 Sep;19(9):767–83. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1474442220302210

144. Bougakov D, Podell K, Goldberg E. Multiple Neuroinvasive Pathways in COVID-19. Mol Neurobiol [Internet]. 2021;58(2):564–75. Available from: https://doi.org/10.1007/s12035-020-02152-5

145. Romero-Sánchez CM, Díaz-Maroto I, Fernández-Díaz E, Sánchez-Larsen Á, Layos-Romero A, García-García J, et al. Neurologic manifestations in hospitalized patients with COVID-19: the ALBACOVID registry. Neurology. 2020;95(8):e1060–70.

146. Romero-Duarte Á, Rivera-Izquierdo M, Guerrero-Fernández de Alba I, Pérez-Contreras M, Fernández-Martínez NF, Ruiz-Montero R, et al. Sequelae, persistent symptomatology and outcomes after COVID-19 hospitalization: the ANCOHVID multicentre 6-month follow-up study. BMC Med [Internet]. 2021 Dec 20;19(1):129. Available from: https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-021-02003-7

147. Drake TM, Riad AM, Fairfield CJ, Egan C, Knight SR, Pius R, et al. Characterisation of in-hospital complications associated with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol UK: a prospective, multicentre cohort study. Lancet [Internet]. 2021 Jul;398(10296):223–37. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673621007996

148. Kumar S, Veldhuis A, Malhotra T. Neuropsychiatric and Cognitive Sequelae of COVID-19. Front Psychol [Internet]. 2021 Mar 2;12. Available from: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.577529/full

149. Pun BT, Badenes R, Heras La Calle G, Orun OM, Chen W, Raman R, et al. Prevalence and risk factors for delirium in critically ill patients with COVID-19 (COVID-D): a multicentre cohort study. Lancet Respir Med [Internet]. 2021 Mar;9(3):239–50. Available from: https://linkinghub.elsevier.com/retrieve/pii/S221326002030552X

150. Erausquin GA, Snyder H, Carrillo M, Hosseini AA, Brugha TS, Seshadri S. The chronic neuropsychiatric sequelae of COVID-19: The need for a prospective study of viral

impact on brain functioning. Alzheimer's Dement [Internet]. 2021 Jun 5;17(6):1056–65. Available from: https://onlinelibrary.wiley.com/doi/10.1002/alz.12255

151. Hewitt KG, Popay AJ, Hofmann RW, Caradus JR. Epichloë − a lifeline for temperate grasses under combined drought and insect pressure. Grass Res [Internet]. 1(1):1–12. Available from: http://www.maxapress.com/article/doi/10.48130/GR-2021-0007

152. Huang C, Huang L, Wang Y, Li X, Ren L, Gu X, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. Lancet [Internet]. 2021 Jan;397(10270):220–32. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620326568

153. Capelli M, Gatti P. Anosmia in the first coronavirus disease 2019 outbreak in Europe: functional recovery after eight months. J Laryngol Otol [Internet]. 2021/02/26. 2021;135(3):224–8. Available from: https://www.cambridge.org/core/article/anosmia-in-the-first-coronavirus-disease-2019-outbreak-in-europe-functional-recovery-after-eight-months/E4A78BC104DF2E1D4A29D4DB1BE91BA9

154. Pezzini A, Padovani A. Lifting the mask on neurological manifestations of COVID-19. Nat Rev Neurol [Internet]. 2020;16(11):636–44. Available from: https://doi.org/10.1038/s41582-020-0398-3

155. Heneka MT, Kummer MP, Stutz A, Delekate A, Schwartz S, Vieira-Saecker A, et al. NLRP3 is activated in Alzheimer's disease and contributes to pathology in APP/PS1 mice. Nature [Internet]. 2013;493(7434):674–8. Available from: https://doi.org/10.1038/nature11729

156. Remsik J, Wilcox JA, Babady NE, McMillen TA, Vachha BA, Halpern NA, et al. Inflammatory Leptomeningeal Cytokines Mediate COVID-19 Neurologic Symptoms in Cancer Patients. Cancer Cell [Internet]. 2021 Feb;39(2):276-283.e3. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1535610821000519

157. Ising C, Venegas C, Zhang S, Scheiblich H, Schmidt S V, Vieira-Saecker A, et al.

NLRP3 inflammasome activation drives tau pathology. Nature [Internet]. 2019;575(7784):669–73. Available from: https://doi.org/10.1038/s41586-019-1769-z

158. Ding Q, Shults N V, Gychka SG, Harris BT, Suzuki YJ. Protein expression of angiotensin-converting enzyme 2 (ACE2) is upregulated in brains with Alzheimer's disease. Int J Mol Sci. 2021;22(4):1687.

159. Zhou H, Lu S, Chen J, Wei N, Wang D, Lyu H, et al. The landscape of cognitive function in recovered COVID-19 patients. J Psychiatr Res [Internet]. 2020 Oct;129:98–102. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0022395620308542

160. Mattioli F, Stampatori C, Righetti F, Sala E, Tomasi C, De Palma G. Neurological and cognitive sequelae of COVID-19: a four month follow-up. J Neurol [Internet]. 2021 Dec 1;268(12):4422–8. Available from: https://link.springer.com/10.1007/s00415-021-10579-6

161. Savikangas T, Törmäkangas T, Tirkkonen A, Alen M, Fielding RA, Kivipelto M, et al. The effects of a physical and cognitive training intervention vs. physical training alone on older adults' physical activity: A randomized controlled trial with extended follow-up during COVID-19. PLoS One [Internet]. 2021;16(10):e0258559. Available from:

162. Gan J, Liu S, Wu H, Chen Z, Fei M, Xu J, et al. The impact of the COVID-19 pandemic on Alzheimer's disease and other dementias. Front Psychiatry [Internet]. 2021;12:703481.

163. Becker JH, Lin JJ, Doernberg M, Stone K, Navis A, Festa JR, et al. Assessment of cognitive function in patients after COVID-19 infection. JAMA Netw Open [Internet]. 2021;4(10):e2130645. Available from:

164. Adouni A, Abdelghaffar W, Blibech H, Boudriga S, Haloui N, Somii B, et al. Assessment of cognitive disorders after COVID-19 infection in Tunisian patients. Int J Psychiatr Res [Internet]. 2022;5(3)

165. Davis HE, Assaf GS, McCorkell L, Wei H, Low RJ, Re'em Y, et al. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. EClinicalMedicine [Internet]. 2021;38(101019):101019.

166. Oh J, Cho W-H, Barcelon E, Kim KH, Hong J, Lee SJ. SARS-CoV-2 spike protein induces cognitive deficit and anxiety-like behavior in mouse via non-cell autonomous hippocampal neuronal death. Sci Rep [Internet]. 2022;12(1):5496.

167. Gouraud C, Bottemanne H, Lahlou-Laforêt K, Blanchard A, Günther S, Batti SE, et al. Association between psychological distress, cognitive complaints, and neuropsychological status after a severe COVID-19 episode: A cross-sectional study. Front Psychiatry [Internet]. 2021;12:725861.

168. Houben S, Bonnechère B. The impact of COVID-19 infection on cognitive function and the implication for rehabilitation: A systematic review and meta-analysis. Int J Environ Res Public Health [Internet]. 2022;19(13):7748.

169. Woo MS, Malsy J, Pöttgen J, Seddiq Zai S, Ufer F, Hadjilaou A, et al. Frequent neurocognitive deficits after recovery from mild COVID-19. Brain Commun [Internet]. 2020;2(2):fcaa205

170. Alemanno F, Houdayer E, Parma A, Spina A, Del Forno A, Scatolini A, et al. COVID-19 cognitive deficits after respiratory assistance in the subacute phase: A COVID-rehabilitation unit experience. PLoS One [Internet]. 2021;16(2):e0246590.

171. Amalakanti S, Arepalli KVR, Jillella JP. Cognitive assessment in asymptomatic COVID-19 subjects. Virusdisease [Internet]. 2021;32(1):146–9.

172. Del Brutto OH, Wu S, Mera RM, Costa AF, Recalde BY, Issa NP. Cognitive decline among individuals with history of mild symptomatic SARS-CoV-2 infection: A longitudinal prospective study nested to a population cohort. Eur J Neurol [Internet]. 2021;28(10):3245–53.

173. Dressing A, Bormann T, Blazhenets G, Schroeter N, Walter LI, Thurow J, et al. Neuropsychologic profiles and cerebral glucose metabolism in neurocognitive long COVID syndrome. J Nucl Med [Internet]. 2022;63(7):1058–63.

174. Hampshire A, Trender W, Chamberlain SR, Jolly AE, Grant JE, Patrick F, et al. Cognitive deficits in people who have recovered from COVID-19. EClinicalMedicine [Internet]. 2021;39(101044):101044.

175. Vyas A, Raja Panwar V, Mathur V, Patel P, Mathur S, Sharma A, et al. Mild cognitive impairment in COVID-19 survivors: Measuring the brain fog. Int J Ment Health

IEC/no-09/2021
Date-22/01/2021

B.L.D.E. (DEEMED TO BE UNIVERSITY)

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: Assessment of Cognitive function in COVID-19 Recovered patients.

Name of PG student: Dr M.Bhargava Swaraj, Department of Psychiatry

Name of Guide/Co-investigator: Dr Santosh Ramdurg, Associate Professor of Psychiatry

DR .S.V.PATIL
CHAIRMAN, IEC
Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

2

B.L.D.E. (DEEMED TO BE UNIVERSITY) SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER, VIJAYAPURA-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned, _____ , S/O D/O W/O _____, aged ____years, ordinarily resident of _____ do hereby state/declare that Dr. MEKALA BHARGAVA SWARAJ of Shri. B. M. Patil Medical College Hospital and Research Centre has explained me thoroughly on _____ at vijayapura(place) and it has been explained to me in my own language that I am recovering from COVID19 disease (condition). Further Doctor Dr. MEKALA BHARGAVA SWARAJ informed me that he is conducting dissertation/research titled "ASSESSMENT OF COGNITIVE FUNCTIONS IN COVID-19 RECOVERED PATIENTS" under the guidance of Dr. SANTOSH RAMDURG requesting my participation in the study. Apart from routine treatment procedure, follow-up observations will be utilized for the study as reference data. Further Doctor has informed me that my participation in this study help in evaluation of the results of the study which is useful reference to treatment of other similar cases in near future.

The Doctor has also informed me that information given by me, observations made photographs, video graphs taken upon me by the investigator will be kept confidential and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on information given by me, I can ask any clarification during the course of treatment / study related to diagnosis, procedure of treatment, result of treatment or prognosis.

At the same time I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time from the study but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned Shri/Smt _____ under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Witness: 1.

Date:

Place

BLDE'S SHRI B.M. PATIL MEDICAL COLLEGE

HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR.

"ASSESSMENT OF COGNITIVE FUNCTION IN COVID-19 RECOVERED PATIENTS"

Name: CASE NO:

Age: IP NO:

Sex: D.O.A:

Religion: Duration of Admission:

Occupation: D.O.D:

Residence:

Address and Mobile number:

Method of diagnosing of covid-19: chest x-ray/Rapid Antigen Antibody test/

RT-PCR/HRCT

SEVERITY: MILD /MODERATE/SEVERE
Previous history of Major medical illness:

- HYPERTENSION:
- DIABETES MELLITUS:
- COPD:
- ANY OPTHER SPECIFY

Previous history of:

- Head injury:
- Mental Retardation:
- Cognitive decline:

Previous history of Mental illness:

Vitals at the time of Admission: PR:

BP: RR: Temp:

Oxygen saturation on the day of Admission:

Vitals at the time of Discharge: PR:

BP: RR: Temp:

Oxygen saturation on the day of discharge:

Investigations on the day of Admission:

CYTOKINES

D-DIMER

FERRITIN

CRP

HRCT SCORING

CHEST X-RAY

LDH

CBC

LFT

UREA

CREATININE

SERUM ELECTROLYTE

Investigations on the day of Discharge:

CYTOKINES

D-DIMER

FERRITIN

CRP

HRCT SCORING

CHEST X-RAY

LDH

CBC

LFT

UREA

CREATININE

SERUM ELECTROLYTES

TREATMENT PROTOCOL GIVEN:

SR.NO	IP NO/ PATIENT ID	PHONE NUMBE	SF ID NO	NAME	AGE	SEX
1	13060/00034067	90011949146	2953000479439	SURESH A JADHAV	52	M
2	11220/00014125	9535589338	2953000419268	RAMESH KADARI	58	M
3	11358/11301	9731070007		SHANTAGOUDA PATIL	55	M
4	11638/00018441	9480385384		JAGDEESH TUKARAM	43	M
5	11760/00019748	8971034823		ASHWINI AMATE	27	F
6	11758/00019744	7483271127	2953000428300	SHAILA ANAND DESAI	48	F
7	11730/000112208	7975652719		SANGAMMA MATHIPATTI	34	F
8	11749/00019701	8147191940		SHRIKANT BAGEWADI	30	M
9	11748/00019688	9900825586	2953000428068	RANJITA B HANCHINAL	22	F
10	11746/00019679	9972448131		NEELAKANTH HANAMANTH	42	M
11	11735/00019627	7204876390	2953000427929	SHRIDHAR DESAI	47	M
12	11753/19797	8277077070		JAYATHIRATA	42	M
13	11872/20888	9538396933	2953000429814	ARJUN PREM SING RATHOD	21	M
14	11869/00020873	8152886033	2953000430339	KAMALA CHAVAN	56	F
15	11892/00020935	7483271127	2953000430333	BHASAVRAJ	50	M
16	11855/00020819	8970842135	2953000430277	SHANKARGOUDA PATIL	41	M
17	11805/00020455	9880636460	2953000429814	NASEEM BANU	53	M
18	11885/20947	9845252689		SEETHARAM CHAVAN	60	F
19	11812/00020457	9663943310	2953000429851	SALEEM BEKANALAKR	57	M
20	11903/00020156	9420678851		ASHOK HUNNU CHAVAN	45	M
21	12049/00022528	7892103968	2953000427634	SHARDA PATIL	46	F
22	12085/00022643	8150907247		BHASAVRAJ	60	M
23	12285/00018454	7019485592		INDIRA MEHATA	34	F
24	12254/00025396	8310181326	2953000441680	JAYALAXMI PUJARI	55	F
25	12267/00024082	9449550659		SATYANAND SHARMA	42	M
26	12262/25454	9901371430	2953000441671	YANKANNA HOSMANE	55	M
27	12312/25633	9880365545		REVANSIDDA IKKALAI	20	M
28	12374/00026625	7204876390	2953000448923	BHIMA VADDAR	52	M
29	12524/00028368	8949068699		SALONI BUDAWANWALA	22	F
30	12526/00025372	93401308022		ISHAN GARG	24	M
31	12382/26638	8749011540	2953000443987	SANGAMESH DASHYAL	50	M
32	12521/28355	8892169919	2953000448848	GOURABAI GADASHETTI	55	F
33	12571/00025927	9767016026		BASAVRAJ KULKARNI	27	M
34	12654/00029827	6362235559	2953000453232	SHIVANAND TODALBAGI	49	M
35	12644/00029780	9108313727	2953000457375	SULOCHANA SHASHIKANT	48	F
36	12558/00026673	9900763784	2953000450574	MALAKANNAH TALAWAR	55	M
37	12660/00029834	9740003316	2953000464063	RAMESH BAVANDI	29	M
38	12577/00028897	7204876390		INDIRA BAI BIRADAR	40	F
39	12635/00029686	9538396933	2953000452686	BALLAPPA shivappa	60	M
40	12550/28429	8152886033		BASAPPA BALAPPA PATIL	32	M
41	12575/00029044	7483271127		CHANDRAKANTH KULKarni	58	M
42	12672/00029876	8970842135		PRABHU NAYKODI	34	M
43	12673/00029881	9880636460		MANJUNATH TAMBE	33	M
44	12788/0003264	9845252689		DASHRATH BABURAO	46	M

45	12671/00029863	9008920510		SOMNATH AGASAR	28	M
46	12796/31241	9663943310	AWAITED	ANNAPURNA BIRADAR	35	F
47	12760/31152	9420678851		BHIMARAYA PUJARI	48	M
48	12678/00029893	7892103968		CHANDRAVATI PUAJAR	51	F
49	12784/00031244	8197251153	2953000457713	GURURINGAMMA PATIL	58	F
50	12776/0003137	9901616588	AWAITED	DAMODAR JOSHI	30	M
51	12744/00029895	9148962914		MANJUNATH VEERKAR	37	M
52	12785/00032161	890466143		RAMU RATHOD	50	M
53	12753/00031173	9845881401		SHIVARANJAN HIREMANTH	54	M
54	12800/31139	8550044000	2953000455921	LAKMIBAI DASHAVANT	45	F
55	12766/31217	9900763552		GANSHYAM CHAVAN	40	M
56	12790/31267	8431338631		BHARATI ASHOK	42	F
57	12963/00032837	9448917122		PARSHURAM DHULAKER	45	M
58	12962/00032833	9001112626		SUMITRABAI KUMBAR	54	F
59	12936/00032795	9845635415		PANCHAPPA ARJUN	45	M
60	12810/31323	9900453554		SHASHIDHAR BIRADR	40	M
61	12817/31332	8310181326	2953000457623	DAJIBA KANASE	36	M
62	12813/31327	8722455247		SUMA NAGANE	45	F
63	12830/00031858	9611033896		GURUNATH TUKARAM	60	M
64	12873/00032660	8310181326		SOMANING HUNASHIKATTI	60	M
65	12883/32712	8970842135		MALLANAGOUDA BIRADAR	40	M
66	12972/00032858	9901500095		ANIL KUMAR BABURAO	49	M
67	13042/00034093	7411219197		MAHANTESH UMADI	59	M
68	13229/00035661	9739682768		SUDHAKAR SIDANNA	38	M
69	13200/00034339	7892103968	2953000465941	SHAMABAI KALLUR	50	F
70	13142/00035124	8050371699		KASHINATH RATHORE	55	M
71	13190/00034637	9611272957		HUNNUSHANKAR RATHORE	60	M
72	13217/00035632	9632690688		RAJA B MAIBOOBSAB	42	F
73	13136/00034807	7892857893		GANGAYYA B	57	M
74	13205/00035517	9901173443		SINITHA MUTAGOUD	38	F
75	13207/00035594	8105959636		RAJAKUMAR DIAGOND	50	M
76	13227/00035654	8880132313		ANAND BALAGANNUR	40	M
77	13222/00035644	9845479501		DINESH RAMESH TIWADI	54	M
78	13181/00035495	9767016026		SUNIL V PATIL	33	M
79	13131/00034319	6362235559		RAMESH A VGAR	55	M
80	13221/00035361	9108313727		BALACHANDRA PATIL	45	M
81	13192/00035542	9900763784		RENUKA MURAGESH ALABAL	26	F
82	13130/00034307	9449851123		MOTIRAM RATHOD	53	M
83	13193/00035548	888407666		SHABBIRSAB JAMADAR	60	M
84	13135/00018371	973195839		SANJIVRAO DESAI	48	M
85	13168/00034112	8123917644		PULASHING RATHOD	55	M
86	13138/00034900	8722295599		ASHOK RATHOD	45	M
87	13237/00035669	7204876390		VITTAL BHIMANNA JADIPETI	55	M
88	13313/35935	8310181326		KIRAN PATIL	35	M
89	13316/36377	8310181326		NAGAPPA RAMAPPA	45	M
90	13315/36384	8310181326		SHEETAL ARAVIND	32	F
91	13317/00036388	8310181326		BHIMASHANAKAR GOUDAPP/	35	M

92	13251/35100	8310181326		SHIVANNAGOUDA	38	M
93	13422/00036336	8310181326	2953000476897	PRAKASH BISANAL	40	M
94	13468/00038999	8310181326		HANNAMAGOUDA KAREKAL	56	M
95	13506/00039171	8310181326		MALLAPPA KUMBAR	55	M
96	13490/00039105	9535589338	2953000478640	BOURAMA MADAGONDA	40	F
97	13469/00037726	9743149630		SANTOSH PATIL	36	M
98	13480/00039072	9900763239		KIRTI KAKHANDAKI	45	F
99	13479/00039066	8197777070		KALPANA AGASAR	28	F
100	13463/00038587	9901091882		IRAGAPPA BHOSHI	38	M
101	13509/00039178	9945479077		BUDDESAB AWATI	43	M
102	13478/00039077	9632412596	2953000481318	BHAGYASHREE HATTALAGE	38	F
103	13438/00038864	9972010651		MEENAKSHI CHANDODE	48	F
104	13484/00039096	7975144226		MAHADEVI KUMBAR	50	F
105	13616/00039231	9606359161		INDUMATI PATIL	17	F
106	13626/00040637	7411186469		ABDUL REHMAN	40	M
107	13522/00039200	8151910155		SHIVAPPA CHANAPPA SHAPET	38	M
108	13632/40586	6361565788		BASAVARAJ HUGAR	35	M
109	13596/39523	8421882553		PARASHURAM SEETHARAM	35	M
110	13638/40616	7204876390	2953000481520	SHIVANAGOUDA PATIL	50	M
111	13641/40626	9900291723		KALLAPAA NAGOD	43	M
112	13582/40511	9591210299		LAXMIBAI BADIGER	50	F
113	13609/40603	7411110651		MAHANTESH HALASANGI	37	M
114	13607/39602	9740788094		MALLAPPA SHIVARAYA	54	M
115	13645/40631	9535589338	2953000481526	SIDDU TORAVI	30	M
116	13621/39660	9845916031		PARVATI TENALI	60	F
117	13552/40414	8747874156		VINOD GOPAL	28	M
118	13605/40557	7204876390		CHIDAMBER VENKATESH	54	M
119	13543/39131	8970842135	2953000479385	RAJESHWARI KOREGOL	43	F
120	13614/40610	9611182129		ADDAMMA KAMANAKERI	28	F
121	13539/39197	8970842135	2953000481503	LINGRAJ MADAGOUD	36	M
122	13598/40580	8139974123		NINGAPPA PERAPPA	50	M
123	13633/40654	9535589338		SAVITRI BIRADAR	48	F
124	13693/00041859	9880226527		SIDDARAYA HONAMORE	36	M
125	13720/00041912	8197634633		SUSHILABAI LAMANI	44	F
126	13696/00041857	8884808837		ABHIMANYU KAMBALE	37	M
127	13664/00039129	8861038533		NAGRAJ CHOLAKE	33	M
128	13741/00041961	9739775378		MUTTANNA VITTAL TALWAR	50	M
129	13658/40656	9449705886		MOTILAL DODDAMANI	48	M
130	13769/00042025	8971429118		SUMANGALA DONUR	35	F
131	13838/00043363	9844704728	2953000481504	SUBHASHCHANDRA R MADAC	48	M
132	13897/00043333	9741290287	2953000487298	SHOBHA BIRADAR	41	F
133	13937/44251	9874563698		KARAN KAMBLI	28	M
134	13930/44292	9874514789		KAMAL KORE	40	F
135	13962/44380	7829936666		PRABHU NIDONE	**49**	M
136	13957/44376	9900736485		MAHADEVI HIREMATH	50	F
137	13919/44271	9632662496		MAIHARUN MEHABOOB	50	F
138	13893/44049	9241492506		SACHGIR AJUTAGI	31	M

139	13956/44367	9740674992		ABHIMANYU KATTIMANI	44	M
140	13916/44210	8970842135	2953000489541	BALACHANDRA DENGANAVAI	40	M
141	13931/44300	9449855272		SRIPAD PATANKAR	49	M
142	13920/44274	9874512478		SHAKUNTHALA BIRADAR	45	F
143	13944/44267	9880256394		BASAPPA MALI	48	M
144	13939/42054	9731092189		SHRISHAIL BIRADAR	52	M
145	13879/43481	7022903643		RANGAWWA SHIVAPPA	52	M
146	13945/44356	9448751901		REKHA SHRIDHAR	47	F
147	13941/00044334	8951228335	2953000490002	VIJAYAKUMAR S PATIL	53	M
148	14076/00044763	9008422911		RAJU G	47	M
149	14074/0004709	9740050862		SADDASHIV	45	M
150	14043/44737	9110254994		RAMESH TONSHYAL	50	M
151	14045/00044732	8548017906		SHIVAMMA UMARAJ	52	F
152	13963/44369	8073897024		VIJAYALAKSHMI KORI	46	M
153	14026/44697	8951625233		SHIVAPPA IVANAGI	30	M
154	13964/44379	7892103968		SANTOSH BIRADAR	30	M
155	14019/44683	8660050207	2953000474914	VISHAL KATAKE	30	M
156	14085/00044823	8748958208		MALLAPPA NARUTI55/M	55	M
157	14080/00044807	8747004127		SHARANAPPA HANUMANTH	40	M
158	14130/00044999	8884319022		KANTAPPA SIRKANALLI	50	M
159	14098/44224	9535589338	2953000489606	RAMESH HARIJAN	48	M
160	14135/46001	8496096326		SIDDAPPA SHASAPPA	34	M
161	14257/00047316	8904541432		PRASHANT YAMAGONDA	33	M
162	14287/00044470	9874514258		SANDEEP	35	M
163	14293/00047432	7760331113	2953000497010	MANGINGAPPA HANCHANAL	51	M
164	14281/00047389	9663943310		SIDANNA GANGANNAHALI	55	M
165	14250/00043418	9420678851		SIDRAMAYYA GURAYA	49	M
166	14296/00047437	7892103968		MARUTI R KALASDAR	32	M
167	14217/00046439	9845239415		SUBHAS GANGADAR	44	M
168	14286/00044558	9448959482		MANTESH ALOOR	46	M
169	14295/00047434	9730773087		SUSHILABAI RATHORE	45	F
170	14285/00046577	8892808396		BHASAVRAJ PATIL	28	M
171	14198/46163	86181662775		MAHANTESH TONSHIYAL	50	M
172	14311/00047454	9880196175		LAXMAN CHAVAN	34	M
173	14302/00047443	86603605459	2953000502675	NAGAPPA PATIL	59	M
174	14309/00047456	9480232699		VEERENDRA PATIL	58	M
175	14359/48706	8971182802	2953000499940	SHANKAR ALBAL	40	M
176	14341/48657	9901198276		PERAPPA MASALI	44	M
177	14389/48766	9880081019		DANASING DEEPALI	44	M
178	14385/41314	8105859504		SANTOSH KUMAR HIREMATH	44	M
179	14332/47542	9538384648		PRAKASH GANACHARI	44	M
180	14363/48698	9986954199		SUGALABAI PATIL	50	F
181	14392/48772	7019418359		SAKKUBAI ROOPASING	50	F
182	14376/48688	9901616588	2953000499889	SURESH DASHWANT	45	M
183	14369/47543	9901616588	2953000499993	RANJANA KORI	47	F
184	14354/48690	9148962914		KRISHNAPPA HADAGALI	60	M
185	14361/48714	9663441827		MAHADEVA PUJARI	44	M

186	14460/00050026	8147663327		SONABAI RATHOD	60	F
187	14462/00049955	9874512478		ASHWINI BIDRI	38	F
188	14409/48813	8904448882		MALLAPPA PADANAD	53	M
189	14394/48781	8861434209		NEELAMMA KADAGOL	41	M
190	14401/48793	7760746183		PRAVEEN DASHYAL	32	M
191	14586/52842	9980690911		ARAVIND RATHOD	37	M
192	14631/00054084	96632660084	2953000510728	MALANBI HAMEED KOTTALA(	40	F
193	14644/00053580	8095331766		GIRISH P TOTAGER	40	M
194	14623/00054088	9880709062		CHANABASAPPA K PURANI	44	M
195	14605/00052896	8446727547		SIDDAMMA DURGAPPA	51	F
196	14608/53502	9686063341		SANGAMESH SAJJAN	35	M
197	14676/00054744	8747908482	2953000512370	KAMALA KULKARNI	58	F
198	14673/00054457	9980932620		SHRISHAIL PUJARI	38	M
199	14722/00055330	8197251153		MAHESH BULARI	35	M
200	14672/00054456	9901616588		APPUPUTARAM CHAVAN	40	M
201	14730/00055348	9148962914		TIPANNA NADAVINAMANI	38	M
202	14661/00054193	890466143		SUREKHA D ALAGI	42	F
203	14660/00054192	9845881401		SANGEEETA NARALI	35	F
204	14742/55357	8550044000		MADIWALAPPA BYALYAL	48	M
205	14781/56051	7758021014		SUREKHA MULAGI	40	F

D.O.A	D.O.D	COMPLAINTS	PAST HISTOR	PR	SPO2%	CBC(HB TLC	CRP	D DIM	L-6 LDI
23-4-21	05-01-21	OUGH/BREATHLESSNESS/3D		117	96	13.8 6.08	47.2	215	
9-4-21	15-04-21	FEVER COUGH COLD				13.9/2.32	29	1295	532
10-4-21	16-04-21	FEVER/COUGH	DM/T	88	94	14.7 4.91	266	1051	497
12-4-21	25-04-21	FEVER BREATHLESNESS		90	88	14.0/7	12.4	549	
13-4-21	18-04-21	FEVER/COUGH/BREATHLES	HTN/DM	82	96		124	50	3.78/5
13-4-21	26-04-21	COUGH/BREATHLESSNESS/	HTN/T	73	82/RA				
13-4-21		COUGH/SPUTUM/FEVER/L	DM	94	98				
13-4-21	18-04-21	FEVER/COUGH/EXPECTORATIION		100	96	15 4000		50	
13-4-21	22-04-21	FEVER/COUGH/BREATHLESSNESS/8D		112	96				
13-4-21	19-04-21	FEVER/COUGH/BREATHLESSNESS/8D		126	93	4.9	20.4		617
13-4-21	19-04-21	FEVER/MYALGIA/3-4D	HTN	86	77/RA				
13-4-21		FEVER/COUGH	DM/T	120	97	13.5 7.12	15.6	314	252
14-4-21	23-04-21	FEVER, BREATHELESS , COUGH		90	86/RA		44	1284	
10-4-21	25-04-21	BREATHELESS , COUGH	HTN/6 MO/II	60	92/RA	12.4 TLC 6!	22.8	574	
12-4-21	23-04-21	BREATHELESS , COUGH		96	88/RA	10.8 TLC 11	>90	214	
13-4-21	19-04-21	BREATHELESS , COUGH	DM	86	90/RA	HB 14.6 3.3	72.9	1126	
13-4-21	19-04-21	BREATHELESS , COUGH	DM/T	100	89	11.1 4.56	44.7	578	DH 33
13-4-21	20-04-21	FEVER,BREATHELESS COU	CVA	74	82		6		
13-4-21	19-04-21	FEVER,BREATHELESS COU	DM	78	84	14.1 6.20	>90	931	
15-4-21	20-04-21	FEVER , WEAKNESS	DM	80	96	15 5.33K	27.9	457	486
15-4-21	21-04-21	FEVR/COUGH/4D		90	98/RA				
16-4-21	23-04-21	FEVER/COUUGH/EXPECTORATION/APPE		110	97	14 4.19	>90	275	237
17-4-21	30-04-21	FEVER/COUGH/BREATHLESSNESS		108	80	10 4000	30.6	1197	
17-4-21	24-04-21	FEVER/COUGH/COLD/BREATHLESS/VOM		81	91/RA				
17-4-21	24-04-21	FEVER BREATHLESNESS COUGH		124	97	14.7/3.88	54	1209	
17-4-21	20-04-21	FEVER/BREATHLESSNESS/COUGH/EXPEC		154	98	12.6 7.08	65.6	291	DH 17
18-4-21	25-04-21	FEVER/COUGH		112	90	15.7 5.42	21.2	1143	
19-4-21	22-04-21	FEVER/BREATHLESSNESS/4D		84	84/RA		80	1332	DH 61
19-4-21	22-04-21	FEVER BREATHLESNESS COUGH		126	84	13.9/8.83	19	479	
19-4-21	22-04-21	LOSE OF SMELL AND TASTE		100	98	17.4/9.43	8.5	166	225
19-4-21	26-04-21	COUGH/BREATHLESSNESS	HTN/DM/T	98	98				
19-4-21	26-04-21	FEVER/BREATHLESSNESS/COUGH		76	92	12.1 8.1	42	229	
20-4-21		FEVER/COUGH/BREATHLESSNESS		70	96	14 2500	35	440	
20-4-21	24-04-21	COUGH/CHEST PAIN/1D		126	93/RA				
20-4-21	29-04-21	COUGH/BREATHLESSNESS/	DM/T	100	96/RA		18	236	DH 19
20-4-21	28-04-21	FEVER/2D/BURNING MICTURITION		88	92	15 6200	1.2		
20-4-21	28-04-21	BREATHLESSNESS/COUGH/3D		80	83/RA		90	580	
20-4-21	28-04-21	CHESTPAI108N/2D		108	94				
20-4-21	27-04-21	FEVER/BREATHLESSNESS/5D		114	92/RA		64	368	
20-4-21	05-10-21	FEVER/BREATHLESSNESS/COUGH		84	91		57	290	
20-4-21	05-04-21	FEVER/BREATHLESSNESS/C	HTN	100	88		37.9	706	IL-6 3.1
21-4-21	27-04-21	BREATHLESSNESS/FEVER/COUGH/3D		100	88	16.5 4900			413
21-4-21	30-04-21	BREATHLESSNESS/2D		106	89		49	423	
21-4-21		BREATHLESSNESS/COUGH/	HTN/T	86	95	16.8 8.27	57.6	1431	

21-4-21	28-04-21	BREATHLESSNESS/COUGH/	DM/T	88	89	13 8000	57			
21-4-21		FEVER,BREATHELESS COUGH		100	96	10.7 7.69	17	268	250	
21-4-21	27-04-21	COUGH/ABDOMINAL DISCOMFORT		86	94	15.3 8.98				
21-4-21	26-04-21	COUGH/ABDOMINAL DIS(	HTN	78	97	14 15.7	6.8			
21-4-21	27-04-21	BREATHLESSNESS		60	92	12.6 8.14	>90	553	341	
21-4-21		FEVER,BREATHELESS COUGH		96	86	14.3 11.39	>90		899	
21-4-21	26-04-21	FEVER,BREATHELESS COUGH		88	88	14.6 7	>90	524		
21-4-21		FEVER,BREATHELESS COU	HTN	65	82	13.3 11.7	80		350	
21-4-21	27-04-21	FEVER,BREATHELESS COUGH		88	97					
21-4-21	04-05-21	BREATHLESNESS		120	50		90	612		
21-4-21	04-05-21	COUGH,FEVR,WEAKNESS		102	88		13	643		
21-4-21	28-04-21	BREATHLESSNESS		100	92					
22-4-21	08-04-21	FEVER/BREATHLESSNESS	HTN/DM	126	84		>90	591		
22-4-21	29-04-21	COUGH	DM/T	110	92	12.5 5.76	15.7	203		
22-4-21	28-04-21	BODYACHE/ABDOMINAL P,	CAD	86	95	13.4 4500	9.5	360		
22-4-21	09-04-21	FEVER,COUGH,BREATHLESI	DM	102	85	12.0,5.0	94	####	737	
22-4-21	01-05-21	COUGH,BREATHLESNESS		110	68	16.0,12.0	42	####	1000	
22-4-21	02-05-21	BREATHLESNESS,FEVER		110	88	11.0,21.0	5	594		
22-4-21	08-05-21	FEVER BREATHLESNESS CO	HTN DM	102	80	13/19	81	195		
22-4-21	01-05-21	BREATHLESNESS	DM	96	92		8	228		
22-4-21	29-04-21	FEVER BREATHLESNESS		98	91	13/3.56	>90	1240	668	
23-4-21	11-05-21			80	82		27.7	422		
23-4-21	28-04-21	FEVER		84	96	12 2200	58	750		
24-4-21	29-04-21	BREATHLESSNESS/FEVER		114	86		75	133	25 LDI	
24-4-21	30-04-21	BREATHLESSNESS/ABDOMINAL DISCOM		105	86/RA	3000 HB 1	85	509		
24-4-21	29-04-21	BREATHLESSNESS/FEVER/COUGH/3D		96	99	14 6	44	830		
24-4-21	27-04-21	BREATHLESSNESS/COUGH	DM/HTN	84	97		>90	2342		
24-4-21	27-04-21	BODYACHE/FEVER		130	90					
24-4-21	28-04-21	FEVER/COUGH/5D		110	92					
24-4-21	30-04-21	BREATHLESSNESS/FEVER/COUGH/3D		89	56	11 9.16	42	6388		
24-4-21	28-04-21	FEVER/COUGH		100	94					
24-4-21	30-04-21	BREATHLESSNESS/FEVER/COUGH/3D		84	91	16.3 3.96	24.7	213		
24-4-21	29-04-21	BODYACHE/FEVER		110	87	13.4 7.96	42.7	561	359	
24-4-21	30-04-21	FEVRR/BREATHLESSNESS		98	97		35			
24-4-21	03-05-21	FEVER/BBREATHLESSNESS/5D		80	92	13.1 7.17	46.5	>10000		
24-4-21		FEVER/BBREATHLESSNESS/3D		90	84	14.3	8.6	1700		
24-4-21	01-05-21	FEVER/BBREATHLESSNESS		98	97					
24-4-21	27-04-21	FEVER/COUGH/3D		122	91					
24-4-21	03-05-21	BREATHLESSNESS/3D		94	99	12.5 10.06		959		
24-4-21	10-05-21	FEVER/BBREATHLESSNESS/CUGH/4D		120	80					
24-4-21	03-05-21	FEVER/COUGH/7D		112	97	13.9 9.37	90	661		
24-4-21	07-05-21	FEVER/BBREATHLESSNESS/CUGH/4D		114	91	16.1 10.16	52.7	576		
25-4-21	05-05-21	BREATHLESSNESS		112	95	17.7 4.87	33.1	409		
25-4-21	06-05-21	FEVER		80	88	11.0,2.0	44	1362	583	
25-4-21	04-05-21	FEVER		100	95		29	454	302	
25-4-21	01-05-21	FEVER		116	98	9.0,4.0	25	721	406	
25-4-21	01-05-21	FEVER BREATHLESNESS			97	16.6/	6.2	260	346	

25-4-21	30-04-21	FEVER/COUGH		96	95					
27-4-21	12-05-21	FEVER/BREATHESSNESS/7D		100	67/RA	TC 6850	84	4449	000 H	
27-4-21	02-05-21	BREATHLESSNESS		110	92	12 19.0				
27-4-21	09-05-21	BREATHLESSNESS/FEVER/COUGH/3D		102	90	14.7 14.09	47.9	230		
27-4-21	15-05-21	BREATHLESSNESS/FEVER/COUGH/3D		120	95/RA					
27-4-21	08-05-21	FEVR/COUGH/BREATHLESSNESS		120	86	13.1 16.88	59.3	635	395	
27-4-21	03-05-21	COUGH		88	98	21.5 6.4	22	300		
27-4-21	06-05-21	BREATHLSSNESS		80	93	15.8 6.91	49	183		
27-4-21	03-05-21	COUGH/BREATHLESSNESS		120	35					
27-4-21	11-05-21	BREATHLESSNESS/3D		110	90		98	274		
27-4-21	03-05-21	FEVR/VOMITING/WEAKNESS		94	96					
27-4-21	03-05-21	LOOSE STOOL/FEVER/1D		87	94	13 15.3	21.1	600		
27-4-21	09-05-21	FEVER/BREATHLESSNESS/COUGH/1w		100	88	12.6 10.0	18.1	209		
28-4-21	05-05-21	WEAKNESS/COUGH/5D	DM/T	105	99	13.3 3.67		472		
28-4-21	05-05-21	BREATHLESSNESS/FEVER/C	DM/HTN	120	92					
28-4-21	07-05-21	BREATHLSSNESS/4D		88	88					
28-4-21	06-05-21	BREATHLESNESS		98	87	11.8,17.0	17	313	484	
28-4-21	08-05-21	CHEST TIGHTNESS	DM	110	96	14.0,7.0	50	325		
28-4-21	06-05-21	COUGH		102	92	15.0,4.0		1550		
28-4-21	07-05-21	COUGH		116	86	15.0,14.0	26	####		
28-4-21	11-05-21	FEVER,COUGH,BREATHLESNESS		90	93	12.4,5.0	90	1917	1000	
28-4-21	10-05-21	BREATHLESNESS	DM	66	89	14.0,5.0	35	388	675	
28-4-21	07-05-21	FEVER,COUGH		134	90	12.0,15.0	64	314	327	
28-4-21	08-05-21	FEVR,BREATHLESNESS		102	91	15.0,4.0	45	481		
28-4-21	03-05-21	BODY PAIN		110	94		70	1153		
28-4-21	04-05-21	BREATHLESNESS		80	99					
28-4-21	03-05-21	FEVER	HTN,DM	82	82	12.0,6.0	90	521	313	
28-4-21	03-05-21	BREATHLESNESS,COUGH		130	90	11.0,8.0	59	987		
28-4-21	04-05-21	BREATHLESNESS,FEVR		100	96	13.0,6.0	72	2400		
28-4-21	04-05-21	COUGH		90	96	13.0,11.0	35	442		
28-4-21	03-05-21	COUGH,BREATHLESNESS		86	83	15.0,10.0	80	1168		
28-4-21	05-05-21	FATIGUE,MYALGIA		128	89	9.0,3.0	29	733	300	
29-4-21	04-05-21	BREATHLESSNESS/COUGH		147	88	147	5.2			
29-4-21	09-05-21			83	84/RA	11.5 15.91	45.6	716	687	
29-4-21	11-05-21	BREATHLESSNESS/3D		88	90	15.2 12.48	75	903		
29-4-21	11-05-21	FEVER/BREATHLESSNESS		101	86	14.5 3000	50.8	345	419	
29-4-21	07-05-21	FEVER/4D		92	89		12.5	522		
29-4-21	07-05-21	BREATHLESNESS	DB	224	64		90	2570		
30-4-21	08-05-21	BREATHLRSSNRESS/COUGH	RVD/ART	116	75		30.2	535		
30-4-21	10-05-21	MYALGIA/FEVER		102	80		>90	6176		
1-5-21	11-05-21	FEVER	DM	88	92					
1-5-21	06-05-21	BREATHLESNESS,		140	85					
1-5-21	06-05-21	CHEST PAIN,COUGH		76	94		15	187		
1-5-21	09-05-21	COUGH,BREATHLESNESS		84	90	15.0,3.0	24	560		
1-5-21	12-05-21	COUGH,BREATHLESNESS		96	95	12	14	811		
1-5-21		FEVER	IHD,HTN	64	89	15.0,12,0	47	361		
1-5-21		WEAKNESS,COUGH,FEVER		92	89	15.0,14.0	46	354	528	

1-5-21	14-05-21	BREATHLESNESS,MYALGIA		96	92	15.0,6.0	77	1286	
1-5-21	08-05-21	BREATHLESNESS,COUGH		94	90	14.2,7.0	20	235	
1-5-21	07-05-21	COUGH,FEVER		102	93	17.0,7.0	54		
1-5-21	07-05-21	COUGH,COLD		100	82				
1-5-21	10-05-21	FEVER,COUGH,LOOSE STOOLS		102	92	15.0,6.0	18	274	
1-5-21	04-05-21	,HEADACHE	DM,HTN	96	99		25		
1-5-21	04-05-21	MYALGIA,LOSS OF APPETITE,COUGH		124	92	12.0,12.0	8.4	415	315
1-5-21	04-05-21	MYALGIA,COUGH	DM	90	98				
1-5-21	10-05-21	FEVER BREATHLESNESS COUGH		86	92				
2-5-21	09-05-21	FEVER/BREATHLESSNESS/3D		77	92	16.7 5K	>90	276	
2-5-21		FEVER/ COUGH/LOOSE STOOL		134	90				
2-5-21	07-05-21	FEVER COUGH BREATHLESI	DM	106	90	14.0/7.52	31.3	248	
2-5-21	09-05-21	BREATHLESNESS FEVER COUGH					12.9	436	
2-5-21	19-05-21	FEVER,BREATHLESNESS		108	88	10.0,8.0	9	283	
2-5-21		FEVER,BREATHLESNESS		100	91	13	45		
2-5-21	05-05-21	COUGH,FEVER		98	91				
2-5-21	09-05-21	COUGH/BREATHLESSNESS		96	90	12.9 4.75	27.8	290	
3-5-21	09-05-21	FEVER/ COUGH	COPD	88	90				
3-5-21	08-05-21	FEVER/ COUGH	DM	96	82	14.4 13000	>90	304	372
3-5-21	19-05-21	BREATHLESNESS COUGH	IHD		92	12.7/14	90	254	
3-5-21	08-05-21	FEVER MYALGIA		112	85	17/9.44	32.7	298	
3-5-21	08-05-21	FEVER/BREATHLESSNESS		90	88		86.5	223	
4-5-21		FEVER/BREATHLESSNESS/COUGH/4D		120	92	13.2 9.82	>90	776	
4-5-21	06-05-21	COUGH		86	90	15 4.93	33	198	
4-5-21	10-05-21	FEVER/COUGH/8D		88	97		16.4	839	
4-5-21	10-05-21	COUGH	DM	102	85		>90	554	
4-5-21	27-04-22	BREATHLRSSNESS/2D	DM	53	92		15.9	709	
4-5-21	11-05-21	FEVER/COUGH/5D		78	88	12.4 /8.66	48.8	221	
4-5-21	11-05-21	FEVER/BREATHLESSNESS/COUGH		90	92		>90	307	
4-5-21	12-05-21	BODYACHE/2D		126	90				
4-5-21	13-05-21	BREATHLESSNESS		76	90	11.1 6.8			
4-5-21	08-05-21	FEVER/BREATHLESSNESS/COUGH/5D		75	96	17.2 2.80	<5	217	275
4-5-21	20-05-21	FEVER	HTN/T	104	84	14.8 8.42	>90	329	
5-5-21	09-05-21	FEVER/BREATHLESSNESSMYALGIA/4D		110	93	14.7 9	76.1	217	
5-5-21	12-05-21	FEVER/BREATHLESSNESS/3	DM/1Y	98	86/RA	11.2 TC 64	65.1	<0.5	
5-5-21	05-05-21	COUGH/BREATHESSNESS/3D		108	93	17.1 3.4	41.2	400	
5-5-21	28-05-21	BREATHLESSNESS		88	88	17.0,6.0	90	362	
5-5-21	07-05-21	FEVER ,BREAYHLESNESS		120	77				
5-5-21	10-05-21	COUGH,BREATHLESNESS	DM,HTN						
5-5-21	12-05-21	FEVER,BREATHLESNESS		104	82	12.0,3.0	30	293	
5-5-21	13-05-21	FEVR,BREATHLESNESS		104	71	8.0,6.0	90	467	
5-5-21	09-05-21	FEVER,BREATHLESNESS		112	91	13.0,4.0	80	810	
5-5-21	09-05-21	FEVER,BREATHLESNESS		90	96				
5-5-21	14-05-21	FEVER,BREATHLESNESS		110	93	14.8,12.0	40	262	
5-5-21	10-05-21	FEVER,COUGH,MYALGIA		120	85	10.0,5.0	18	234	
5-5-21	17-05-21	FEVER,BREATHLESNESS,COUGH		102	97	14.0,21.0			
5-5-21	10-05-21	FEVER,COUGH							

6-5-21	14-05-21		68	45	11.2	12000	32.9	367	792
6-5-21	18-05-21	FEVER/BREATHLESSNESS	95	91	9.4	5.46	26	224	
6-5-21	10-05-21	FEVER,BREATHELESS COUGH	120	82					
6-5-21	16-05-21	BREATHLESSNESS	116	77					
6-5-21	15-05-21	FEVER,BREATHELESS COU DM	102	80			90	361	
9-5-21	17-05-21	FEVER/BREATHLESSNESS	140	92					
10-5-21	18-05-21	BREATHLESNESS MYALGIA	120	92	12.5/12		34.6	486	
10-5-21	17-05-21	BREATHLESNESS COUGH	76	80	6.8/17		90	8336	
10-5-21	15-05-21	BREATHLESNESS	90	94	14.0/7		14	180	
10-5-21	12-05-21	COUGH	86	92					
10-5-21	19-05-21	FEVER		98	13.1/20.69		13.5	682	
11-5-21	18-05-21	FEVER/BREATHLESSNESS	86	82	11.2	9.23K	18.3	867	
11-5-21	16-05-21	BREATHLESSNESS/COUGH/3D	86	98			49	470	
11-5-21	15-05-21	FEVER/BREATHLESSNESS	112	90	9.4	4.39	97	1250	
11-5-21	14-05-21	BREATHLESSNESS	120	94	13	7.54	35	314	
11-5-21		BREATHLESSNESS/3D	110	78					
11-5-21		FEVER BREATHLESNESS	108	75	9.6/9.4		25	982	
11-5-21		BREATHLESNESS	120	85	13.0/8		14	273	
12-5-21		BREATHLESSNESS	78	97	17,8.0		90	228	
12-5-21		COUGH , STOMACH PAIN	96	90	12,7.0		35	253	

HRCT(S	RAD(SCO	DIAGNOSIS	PROGNOSI	TMT-A	TMT-B	PGI Memo	Remote m	recent mei	mental bal
8	5	PNEUMON	IMPROVED	25	58	61	7	5	6
8	5			30	85	53	7	5	5
12	6			26	72	63	7	5	6
16	5			23	46	71	7	5	7
12	3		IMPROVED	23	45	74	7	5	7
20		B/L SEVERI	IMPROVED	28	58	61	7	5	6
12	5		IMPROVED	23	47	73	7	5	7
8	5		IMPROVED	22	45	76	7	5	7
10	5		IMPROVED	20	45	76	7	5	7
12	5		IMPROVED	21	46	70	7	5	7
17		B/L SEVERI	IMPROVED	26	59	64	7	5	6
7	6			23	48	71	7	5	7
11	5	PNEUMON	IMPROVED	20	46	73	7	5	7
8	4	PNEUMON	IMPROVED	30	85	55	7	5	5
14	4	PNEUMON	IMPROVED	26	62	64	7	5	6
10	4	PNEUMON	IMPROVED	24	49	71	7	5	7
8	4	PNEUMON	IMPROVED	26	68	61	7	5	6
14	4	PNEUMONIA	DUE TO	58	85	53	7	5	5
17	4	PNEUMONIA	DUE TO	31	82	54	7	5	5
7	5	PNEUMON	IMPROVED	23	55	71	7	5	7
7		B/L MILD C	IMPROVED	25	72	61	7	5	6
10	5		IMPROVED	40	81	53	7	5	5
21	4	PNEUMON	IMPROVED	23	45	70	7	5	7
11		B/L MODE	IMPROVED	29	45	63	7	5	6
12	5			22	46	71	7	5	7
3	5			26	59	61	7	5	6
15	5			20	48	73	7	5	7
20		B/L SEVERI	IMPROVED	26	73	61	7	5	6
				20	45	75	7	5	7
0	1			21	45	77	7	5	7
16	5			26	59	61	7	5	6
18	5			27	67	61	7	5	6
20	5		IMPROVED	20	45	74	7	5	7
0		B/L MILD C	IMPROVED	26	73	62	7	5	6
13		B/L MODE	IMPROVED	28	71	64	7	5	6
10	15	B/L MODE	IMPROVED	29	74	62	7	5	6
15		B/L MODE	IMPROVED	21	45	74	7	5	7
6	5		IMPROVED	23	46	71	7	5	7
7		B/L MILD C	IMPROVED	40	85	53	7	5	5
19	5		IMPROVED	23	47	68	7	5	7
20	5		IMPROVED	34	76	53	7	5	5
17	5		IMPROVED	23	45	74	7	5	7
16	5			22	46	73	7	5	7
3	5	B/L MILD	COVID PNEU	25	59	63	7	5	6

12	4	B/L MODERATE COVIE	23	45	74	7	5	7
10	3	IMPROVED	21	46	71	7	5	7
18	5	PNEUMON IMPROVED	26	67	63	7	5	6
11	4	PNEUMON IMPROVED	26	64	61	7	5	6
21	5	PNEUMON IMPROVED	32	78	53	7	5	5
17	4		21	45	74	7	5	7
16		PNEUMONIA DUE TO	22	45	74	7	5	7
20	5	PNEUMONIA DUE TO	25	62	61	7	5	6
18	5	PNEUMONIA DUE TO	26	69	62	7	5	6
		PNEUMON IMPROVED	21	49	69	7	5	7
12	5	PNEUMON IMPROVED	22	48	72	7	5	7
23	5		23	46	70	7	5	7
8	5	PNEUMONIA DUE TO	24	46	74	7	5	7
21	5	PNEUMONIA DUE TO	26	63	64	7	5	7
13	5		21	46	71	7	5	6
15	5	PNEUMON IMPROVED	23	48	72	7	5	7
15	5	PNEUMON IMPROVED	20	47	74	7	5	7
21	5	PNEUMON IMPROVED	21	49	73	7	5	7
17	5		35	85	57	7	5	7
11	5		40	85	51	7	5	5
24	5	IMPROVED	20	45	66	7	5	5
21	5	PNEUMONIA DUE TO	26	64	64	7	5	7
15	5	B/L MODERATE COVIE	39	75	58	7	5	6
30/40			21	45	63	7	5	5
15		B/L MODERATE COVIE	26	65	67	7	5	7
14	5		29	66	62	7	5	6
8	5		40	85	56	7	5	6
13	4	B/L MODERATE COVIE	23	49	67	7	5	7
8	5		35	84	56	7	5	5
			24	45	69	7	5	7
5	5	B/L MODERATE COVIE	28	67	62	7	5	6
12	5	B/L MODERATE COVIE	22	45	72	7	5	7
10	5	B/L MODERATE COVIE	26	68	63	7	5	6
13	5	B/L MODERATE COVIE	20	46	73	7	5	7
15	5		29	69	61	7	5	6
18	5		23	49	70	7	5	7
16	5		24	45	75	7	5	7
			28	58	61	7	5	6
14	5		32	85	54	7	5	5
5	5		27	71	61	7	5	6
15	6		29	73	63	7	5	6
15	5		24	49	71	7	5	7
13	5	B/L MODERATE COVIE	29	74	63	7	5	6
11	5	PNEUMON IMPROVED	21	54	72	7	5	7
13	4	PNEUMON IMPROVED	23	55	73	7	5	7
18	5	PNEUMON IMPROVED	22	46	72	7	5	7
10	5		24	47	75	7	5	7

0	1		21	48	75	7	5	7
17		B/L MODERATE COVIE	21	49	70	7	5	7
20	5	B/L MODERATE COVIE	36	83	54	7	5	5
8	5	B/L MODERATE COVIE	29	51	63	7	5	6
15	5	B/L MODERATE COVIE	23	49	71	7	5	7
9	4	B/L MODERATE COVIE	22	48	73	7	5	7
12	5		24	55	73	7	5	7
13	5		21	45	74	7	5	7
15	5		20	46	73	7	5	7
20	5		24	47	72	7	5	7
11	5		23	46	71	7	5	7
9	5		25	72	62	7	5	6
22	5		26	73	65	7	5	6
9	5	B/L MODERATE COVIE	20	47	75	7	5	7
11	5		23	48	73	7	5	7
17	5		21	49	73	7	5	7
17	5	PNEUMON IMPROVED	24	50	71	7	5	7
12	5	PNEUMON IMPROVED	24	50	69	7	5	7
17	5	PNEUMON ON REQUE	28	68	64	7	5	6
13	5	PNEUMON IMPROVED	22	51	71	7	5	7
16	5	PNEUMON ON REQUE	27	64	63	7	5	6
5	5	PNEUMON IMPROVED	23	52	73	7	5	7
17	5	PNEUMON IMPOVED	28	63	64	7	5	6
15	5	PNEUMON IMPROVED	20	54	69	7	5	7
15	5	PNEUMON IMPROVED	39	85	55	7	5	5
9	5	PNEUMON IMPROVED	21	45	74	7	5	7
16	5	PNEUMON IMPROVED	26	73	65	7	5	6
17	5	PNEUMON IMPROVED	24	46	71	7	5	7
17	4	PNEUMON IMPROVED	23	45	76	7	5	7
14	5	PNEUMON IMPROVED	22	45	71	7	5	7
15	5	PNEUMON IMPROVED	26	73	61	7	5	6
16	4	PNEUMON IMPROVED	27	48	63	7	5	6
10	4	PNEUMONIA DUE TO	21	45	71	7	5	7
16	5	PNEUMONIA DUE TO	20	46	75	7	5	7
18	5	PNEUMONIA DUE TO	23	45	73	7	5	7
12	5	PNEUMONIA DUE TO	20	47	69	7	5	7
13	5		26	74	62	7	5	6
15	5	PNEUMON IMPOVED	27	62	63	7	5	6
19			21	48	71	7	5	7
8	5	PNEUMON IMPROVED	28	63	64	7	5	6
		PNEUMONIA DUE TO	24	46	72	7	5	7
17	5	PNEUMON IMPROVED	20	45	74	7	5	7
16	5	PNEUMON IMPROVED	21	47	71	7	5	7
20	5	PNEUMON IMPROVED	26	64	61	7	5	6
17	5	PNEUMON IMPROVED	27	65	62	7	5	6
7	4	PNEUMON IMPROVED	27	66	63	7	5	6
17	5	PNEUMON AMA	23	45	75	7	5	7

19	5	PNEUMON DAMA	21	46	75	7	5	7
16	5	PNEUMON IMPROVED	20	47	72	7	5	7
17	5	PNEUMON IMPROVED	27	67	64	7	5	6
17	5	PNEUMON IMPROVED	24	48	68	7	5	7
18	5	PNEUMON IMPROVED	26	68	63	7	5	6
10	5	PNEUMON IMPROVED	28	69	65	7	5	6
10	5	PNEUMON IMPROVED	26	70	63	7	5	6
10		PNEUMON IMPROVED	28	71	62	7	5	6
			27	72	63	7	5	6
18	5	PNEUMONIA DUE TO	25	70	62	7	5	6
18	5	PNEUMONIA DUE TO	24	49	72	7	5	7
18	5		28	73	61	7	5	6
13	5		27	74	62	7	5	6
15	5	PNEUMON IMPROVED	26	63	62	7	5	6
9	5	PNEUMON IMPROVED	20	45	74	7	5	7
15	5	PNEUMON IMPROVED	20	45	74	7	5	7
6	5		20	45	75	7	5	7
20	5	PNEUMONIA DUE TO	29	64	62	7	5	6
18		PNEUMONIA DUE TO	21	46	71	7	5	7
20	6		26	65	64	7	5	6
12	5		27	66	63	7	5	6
20	5		22	47	73	7	5	7
15		B/L MODERATE COVID	21	46	74	7	5	7
7			21	47	74	7	5	7
19			26	67	61	7	5	6
14	5		29	68	62	7	5	6
3	5		27	69	63	7	5	6
17	5	B/L MILD COVID PNEU	22	48	73	7	5	7
6	5	B/L MILD COVID PNEU	23	49	72	7	5	7
9	5	B/L MILD COVID PNEU	28	70	63	7	5	6
2	5	B/L MILD COVID PNEU	20	45	70	7	5	7
8	5	B/L MILD COVID PNEU	20	46	73	7	5	7
23	5		26	57	61	7	5	6
20	5	B/L MILD COVID PNEU	20	45	72	7	5	7
15		B/L MODERATE COVID	31	76	54	7	5	5
			32	77	54	7	5	5
18	5	PNEUMON IMPROVED	20	47	70	7	5	7
		PNEUMON DAMA	21	48	72	7	5	7
14	5	PNEUMON IMPROVED	22	49	72	7	5	7
7	5	PNEUMON IMPROVED	20	45	70	7	5	7
		PNEUMON IMPROVED	21	46	71	7	5	7
18	5	PNEUMON IMPROVED	26	58	61	7	5	6
18	5	PNEUMON IMPROVED	26	59	65	7	5	6
15	5	PNEUMON IMPROVED	22	54	68	7	5	7
14	6	PNEUMON IMPROVED	26	59	59	7	5	6
16	6	PNEUMON IMPROVED	40	84	57	7	5	5
21		PNEUMON DAMA	20	53	66	7	5	7

21	5	PNEUMONIA DUE TO	40	84	57	7	5	5
21	5	PNEUMONIA DUE TO	21	45	71	7	5	7
20	5	PNEUMON IMPROVED	26	72	63	7	5	6
20	5	PNEUMON IMPROVED	20	46	72	7	5	7
17	5	PNEUMON IMPROVED	21	47	75	7	5	7
9	5		22	48	70	7	5	7
18	5		20	49	71	7	5	7
17	5		20	49	71	7	5	7
21	5		23	45	72	7	5	7
19	5		26	73	63	7	5	6
21	5		20	45	70	7	5	7
15	5	PNEUMONIA DUE TO	39	83	53	7	5	5
12	5	B/L MODERATE COVID	21	45	73	7	5	7
13	5	B/L MODERATE COVID	20	46	75	7	5	7
21		B/L SEVERE COVID PN	22	46	73	7	5	7
17	6	B/L MODERATE COVID	23	47	73	7	5	7
15	5		24	54	70	7	5	7
20	5		20	55	71	7	5	7
18	5	PNEUMON IMPROVED	28	56	63	7	5	6
15	5	PNEUMON IMPROVED	20	45	73	7	5	7

attention a	delayed re	immediate	verbal rete	verbal rete	visual rete	recognitio	MAZE TET-	MAZE TET-	DSST
7	7	5	5	9	4	6	11	12	82
5	5	4	5	10	2	5	16	13	83
7	7	5	5	11	4	6	15	20	85
9	8	6	5	9	6	9	10	19	88
9	9	6	5	12	6	8	10	18	89
7	7	5	5	9	4	6	11	13	81
9	8	7	5	9	6	10	12	12	85
9	9	7	5	13	6	8	11	14	85
9	8	7	5	13	6	9	10	14	87
9	8	6	5	9	6	8	11	14	87
7	7	5	5	11	4	7	10	13	81
9	8	7	5	9	6	8	10	12	88
9	9	7	5	9	6	9	10	12	86
5	7	4	5	10	2	5	17	23	82
7	9	5	5	9	4	7	11	12	83
9	7	6	5	11	6	8	10	13	85
7	7	5	5	9	4	6	10	13	84
5	5	4	5	10	2	5	20	25	84
5	6	4	5	10	2	5	18	24	81
9	9	6	5	9	6	8	10	12	90
7	7	5	5	9	4	6	10	12	82
5	5	4	5	10	2	5	20	25	85
9	8	6	5	9	6	8	11	13	86
7	7	5	5	11	4	6	12	13	81
9	8	7	5	9	6	8	13	14	87
7	7	5	5	9	4	6	10	12	82
9	8	6	5	12	6	8	11	12	88
7	7	5	5	9	4	6	11	12	83
9	8	6	5	13	6	9	10	13	87
9	9	6	5	13	6	10	10	13	85
7	7	5	5	9	4	6	10	13	81
7	7	5	5	9	4	6	11	14	82
9	9	6	5	12	6	8	10	12	86
7	7	5	5	9	4	7	11	14	83
7	7	5	5	11	4	7	11	13	84
7	7	5	5	9	4	7	13	13	84
9	8	6	5	13	6	8	10	14	85
9	8	6	5	9	6	9	10	12	86
5	5	4	5	10	2	5	20	12	85
7	8	6	5	9	6	8	10	12	85
5	5	4	5	10	2	5	16	16	84
9	8	7	5	11	6	9	10	23	86
9	9	7	5	9	6	9	11	17	87
7	7	5	5	11	4	6	12	18	83

9	8	7	5	12	6	8	13	17	88
9	8	7	5	9	6	8	11	16	86
7	7	5	5	11	4	6	12	18	82
7	7	5	5	9	4	6	13	12	81
5	5	4	5	10	2	5	17	22	82
9	8	6	5	13	6	8	11	12	85
9	9	6	5	11	6	9	10	13	85
7	7	5	5	9	4	6	10	14	83
7	7	5	5	9	4	7	10	14	84
7	8	7	5	9	6	8	11	12	90
9	9	7	5	9	6	8	11	12	87
9	8	6	5	9	6	8	11	13	87
9	9	6	5	11	6	9	10	12	90
7	7	7	5	9	4	6	10	13	80
9	8	5	5	11	6	9	10	12	90
9	8	6	5	11	6	8	11	12	87
9	8	6	5	11	6	10	12	14	86
9	9	6	5	9	6	10	13	15	85
5	5	6	5	10	2	5	20	25	85
5	5	2	5	10	2	5	20	25	84
9	8	2	5	11	6	8	10	20	86
7	7	6	5	9	4	7	11	16	83
7	7	4	5	10	2	5	16	25	84
9	5	2	5	11	6	8	12	13	87
7	9	6	5	11	4	6	11	12	81
7	7	4	5	10	4	7	10	25	80
5	7	4	5	10	2	5	20	13	85
9	5	6	5	9	6	8	11	25	58
7	8	2	5	10	2	5	16	16	81
9	5	6	5	11	6	8	12	12	87
7	8	4	5	10	4	6	13	13	82
9	9	6	5	9	6	9	11	12	86
7	9	4	5	9	4	7	11	12	83
9	9	6	5	9	6	10	10	12	85
7	7	4	5	10	4	6	10	12	83
9	8	6	5	9	6	8	10	12	85
9	9	6	5	12	6	9	11	13	85
7	7	4	5	10	4	6	10	18	81
5	5	5	5	10	2	5	20	24	82
7	7	5	5	9	4	6	11	19	81
7	7	6	5	10	4	6	12	17	84
9	8	5	5	11	6	8	13	16	90
7	7	7	5	9	4	6	11	18	84
9	8	7	5	9	6	9	10	13	86
9	9	6	5	9	6	10	11	12	90
9	9	7	5	9	6	8	12	14	86
9	9	7	5	11	6	9	11	14	87

9	9	8	5	11	6	8	10	14	85
9	9	4	5	9	6	9	13	12	86
5	5	5	5	10	2	5	17	23	84
7	7	6	5	10	4	6	11	19	85
9	8	7	5	9	6	8	10	12	85
9	8	6	5	11	6	9	11	12	85
9	8	7	5	9	6	10	10	12	90
9	8	6	5	13	6	8	11	13	85
9	8	6	5	11	6	9	11	13	85
9	8	6	5	11	6	8	11	13	87
9	8	5	5	11	6	8	10	13	85
7	7	5	5	9	4	7	11	12	81
7	7	6	5	11	4	7	12	12	82
9	8	7	5	13	6	8	11	14	85
9	8	7	5	11	6	8	10	13	86
9	9	7	5	9	6	9	10	14	86
9	8	7	5	9	6	8	10	14	85
9	8	5	5	9	6	8	10	14	85
7	7	6	5	10	4	7	11	12	83
9	8	5	5	11	6	8	11	12	88
7	7	6	5	10	4	6	11	13	84
9	9	5	5	11	6	9	11	16	85
7	7	6	5	11	4	6	11	17	84
9	9	4	5	9	6	8	13	13	85
5	5	6	5	10	2	5	20	24	83
9	9	5	5	13	6	8	11	16	86
7	7	7	5	11	4	6	12	17	83
9	9	6	5	9	6	8	13	13	88
9	9	6	5	13	6	9	10	18	88
9	8	5	5	11	6	8	10	12	85
7	7	5	5	9	4	6	10	13	83
7	7	6	5	9	4	7	11	14	82
9	9	6	5	9	6	8	11	12	85
9	9	7	5	11	6	9	12	16	86
9	8	7	5	9	6	10	13	17	85
9	8	5	5	9	6	8	10	16	85
7	7	5	5	10	4	6	11	12	81
7	7	6	5	9	4	7	13	18	81
9	9	5	5	10	6	8	14	17	86
7	7	6	5	11	4	6	12	16	81
9	9	7	5	9	6	8	10	14	87
9	8	7	5	12	6	8	10	13	85
9	8	5	5	11	6	8	10	12	86
7	7	5	5	9	4	6	11	12	84
7	7	5	5	9	4	7	11	19	85
7	7	6	5	9	4	7	11	19	85
9	8	6	5	13	6	9	13	12	87

9	9	7	5	11	6	9	13	16	88
9	9	5	5	9	6	10	12	16	86
7	9	6	5	9	4	6	10	16	83
9	7	5	5	9	6	8	10	16	90
7	9	5	5	9	4	6	10	16	81
7	9	5	5	10	4	7	10	12	82
7	7	5	5	11	4	6	10	12	82
7	7	5	5	9	4	7	10	13	81
7	7	5	5	11	4	6	11	12	82
7	7	5	5	9	4	7	10	14	81
9	8	6	5	11	6	8	11	15	90
7	7	5	5	9	4	6	10	15	83
7	7	5	5	9	4	7	11	16	82
7	7	5	5	9	4	7	13	13	81
9	8	6	5	12	6	9	10	17	85
9	8	6	5	12	6	9	10	17	85
9	8	6	5	13	6	9	10	16	85
7	7	5	5	9	4	7	11	12	83
9	9	6	5	9	6	8	12	13	86
7	7	5	5	11	4	7	12	13	81
7	7	5	5	11	4	6	10	16	81
9	9	6	5	11	6	8	11	16	87
9	8	7	5	11	6	9	11	17	85
9	9	7	5	9	6	10	13	12	86
7	7	5	5	9	4	6	13	13	82
7	7	5	5	9	4	7	13	18	83
7	7	5	5	11	4	6	10	19	84
9	8	7	5	11	6	8	10	19	85
9	8	7	5	10	6	8	10	13	89
7	7	5	5	10	4	7	10	12	83
9	8	6	5	9	6	8	10	12	85
9	9	6	5	10	6	9	10	12	85
7	7	5	5	9	4	6	11	12	80
9	8	6	5	11	6	8	11	13	86
5	6	4	5	10	2	5	16	22	84
5	6	4	5	10	2	5	16	23	84
9	8	6	5	9	6	8	12	18	85
9	8	6	5	11	6	8	12	19	87
9	8	6	5	11	6	8	12	19	87
9	8	6	5	9	6	8	14	19	88
7	9	6	5	11	6	8	14	19	88
7	7	5	5	9	4	6	15	18	84
9	7	5	5	11	4	6	15	18	84
7	8	6	5	9	6	8	11	13	90
5	7	5	5	9	4	6	11	14	80
9	5	4	5	10	2	5	16	23	81
5	8	6	5	9	6	8	12	15	85

9	5	4	5	10	2	5	17	23	81
7	8	6	5	12	6	8	12	16	85
9	7	5	5	9	4	6	10	13	82
9	8	6	5	11	6	8	11	14	86
9	8	6	5	13	6	9	12	15	86
9	8	6	5	9	6	8	10	13	87
9	8	6	5	9	6	9	11	14	87
9	9	6	5	9	6	8	11	14	87
9	8	6	5	11	6	8	12	15	88
7	7	5	5	9	4	8	12	13	83
9	8	6	5	11	6	6	13	17	89
5	5	4	5	10	2	5	18	23	84
9	8	6	5	12	6	8	11	13	85
9	8	6	5	13	6	9	11	14	85
9	8	6	5	12	6	8	12	15	86
9	8	6	5	11	6	9	11	16	86
9	8	6	5	9	6	8	12	13	87
9	8	6	5	9	6	9	13	14	87
7	7	5	5	11	4	6	10	15	80
9	9	6	5	11	6	8	10	16	89

MMSE	FOLLOW U	TMTA	TMTB	PGI MEMC	remote me	recent mei	mental bal	attention a	delayed re
24		25	58	61	7	5	6	7	7
21		41	86	52	6	4	4	4	4
25		26	72	63	7	5	6	7	7
24		23	46	71	7	5	7	9	8
24		23	45	74	7	5	7	9	9
25		28	58	61	7	5	6	7	7
26		23	47	73	7	5	7	9	8
26		22	45	76	7	5	7	9	9
25		20	45	76	7	5	7	9	8
24		21	46	70	7	5	7	9	8
24		26	59	64	7	5	6	7	7
25		23	48	71	7	5	7	9	8
24		20	46	73	7	5	7	9	9
19		41	86	42	6	4	4	4	4
25		26	62	64	7	5	6	7	9
26		24	49	71	7	5	7	9	7
27		26	68	61	7	5	6	7	7
23		41	86	42	6	4	4	4	4
22		41	86	42	6	4	4	4	4
28		23	55	71	7	5	7	9	9
29		25	72	61	7	5	6	7	7
21		41	86	42	6	4	4	4	4
30		23	45	70	7	5	7	9	8
30		29	45	63	7	5	6	7	7
24		22	46	71	7	5	7	9	8
25		26	59	61	7	5	6	7	7
24		20	48	73	7	5	7	9	8
26		26	73	61	7	5	6	7	7
24		20	45	75	7	5	7	9	8
24		21	45	77	7	5	7	9	9
26		26	59	61	7	5	6	7	7
27		27	67	61	7	5	6	7	7
25		20	45	74	7	5	7	9	9
26		26	73	62	7	5	6	7	7
28		28	71	64	7	5	6	7	7
28		29	74	62	7	5	6	7	7
29		21	45	74	7	5	7	9	8
30		23	46	71	7	5	7	9	8
23		41	86	42	6	4	4	4	4
24		23	47	68	7	5	7	7	8
23		41	86	42	6	4	4	4	4
29		23	45	74	7	5	7	9	8
24		22	46	73	7	5	7	9	9
29		25	59	63	7	5	6	7	7

30	23	45	74	7	5	7	9	8
26	21	46	71	7	5	7	9	8
27	26	67	63	7	5	6	7	7
28	26	64	61	7	5	6	7	7
22	41	86	42	6	4	4	4	4
29	21	45	74	7	5	7	9	8
30	22	45	74	7	5	7	9	9
26	25	62	61	7	5	6	7	7
26	26	69	62	7	5	6	7	7
25	21	49	69	7	5	7	7	8
24	22	48	72	7	5	7	9	9
24	23	46	70	7	5	7	9	8
25	24	46	74	7	5	7	9	9
26	26	63	64	7	5	7	7	7
25	21	46	71	7	5	6	9	8
25	23	48	72	7	5	7	9	8
25	20	47	74	7	5	7	9	8
30	21	49	73	7	5	7	9	9
23	41	86	43	6	5	4	4	4
22	41	86	42	6	4	4	4	4
28	20	45	65	7	4	5	9	8
26	26	64	64	7	5	7	7	7
21	41	86	43	6	4	4	4	4
27	21	45	63	7	5	5	9	5
26	26	65	67	7	5	7	7	9
26	29	66	62	7	5	6	7	7
23	41	86	42	6	4	4	4	4
27	23	49	67	7	5	7	9	5
19	41	86	42	6	4	4	4	4
26	24	45	69	7	5	7	9	5
25	28	67	62	7	5	6	7	8
26	22	45	72	7	5	7	9	9
27	26	68	63	7	5	6	7	9
28	20	46	73	7	5	7	9	9
27	29	69	61	7	5	6	7	7
27	23	49	70	7	5	7	9	8
26	24	45	75	7	5	7	9	9
24	28	58	61	7	5	6	7	7
18	41	86	42	6	4	4	4	4
25	27	71	61	7	5	6	7	7
24	29	73	63	7	5	6	7	7
26	24	49	71	7	5	7	9	8
24	29	74	63	7	5	6	7	7
26	21	54	72	7	5	7	9	8
25	23	55	73	7	5	7	9	9
30	22	46	72	7	5	7	9	9
24	24	47	75	7	5	7	9	9

26	21	48	75	7	5	7	9	9
25	21	49	70	7	5	7	9	9
19	41	86	42	6	4	4	4	4
27	29	51	63	7	5	6	7	7
28	23	49	71	7	5	7	9	8
25	22	48	73	7	5	7	9	8
30	24	55	73	7	5	7	9	8
29	21	45	74	7	5	7	9	8
24	20	46	73	7	5	7	9	8
26	24	47	72	7	5	7	9	8
24	23	46	71	7	5	7	9	8
25	25	72	62	7	5	6	7	7
24	26	73	65	7	5	6	7	7
25	20	47	75	7	5	7	9	8
26	23	48	73	7	5	7	9	8
26	21	49	73	7	5	7	9	9
24	24	50	71	7	5	7	9	8
24	24	50	69	7	5	7	9	8
25	28	68	64	7	5	6	7	7
26	22	51	71	7	5	7	9	8
27	27	64	63	7	5	6	7	7
28	23	52	73	7	5	7	9	9
26	28	63	64	7	5	6	7	7
24	20	54	69	7	5	7	9	9
18	41	86	42	6	4	4	4	4
26	21	45	74	7	5	7	9	9
25	26	73	65	7	5	6	7	7
27	24	46	71	7	5	7	9	9
28	23	45	76	7	5	7	9	9
24	22	45	71	7	5	7	9	8
25	26	73	61	7	5	6	7	7
26	27	48	63	7	5	6	7	7
24	21	45	71	7	5	7	9	9
25	20	46	75	7	5	7	9	9
26	23	45	73	7	5	7	9	8
26	20	47	69	7	5	7	9	8
25	26	74	62	7	5	6	7	7
24	27	62	63	7	5	6	7	7
27	21	48	71	7	5	7	9	9
28	28	63	64	7	5	6	7	7
27	24	46	72	7	5	7	9	9
24	20	45	74	7	5	7	9	8
27	21	47	71	7	5	7	9	8
26	26	64	61	7	5	6	7	7
30	27	65	62	7	5	6	7	7
30	27	66	63	7	5	6	7	7
28	23	45	75	7	5	7	9	8

28	21	46	75	7	5	7	9	9
24	20	47	72	7	5	7	9	9
25	27	67	64	7	5	6	7	9
26	24	48	68	7	5	7	9	7
27	26	68	63	7	5	6	7	9
28	28	69	65	7	5	6	7	9
24	26	70	63	7	5	6	7	7
25	28	71	62	7	5	6	7	7
26	27	72	63	7	5	6	7	7
26	25	70	62	7	5	6	7	7
25	24	49	72	7	5	7	9	8
24	28	73	61	7	5	6	7	7
26	27	74	62	7	5	6	7	7
28	26	63	62	7	5	6	7	7
30	20	45	74	7	5	7	9	8
30	20	45	74	7	5	7	9	8
30	20	45	75	7	5	7	9	8
29	29	64	62	7	5	6	7	7
28	21	46	71	7	5	7	9	9
29	26	65	64	7	5	6	7	7
26	27	66	63	7	5	6	7	7
26	22	47	73	7	5	7	9	9
25	21	46	74	7	5	7	9	8
25	21	47	74	7	5	7	9	9
24	26	67	61	7	5	6	7	7
26	29	68	62	7	5	6	7	7
27	27	69	63	7	5	6	7	7
28	22	48	73	7	5	7	9	8
29	23	49	72	7	5	7	9	8
30	28	70	63	7	5	6	7	7
24	20	45	70	7	5	7	9	8
24	20	46	73	7	5	7	9	9
26	26	57	61	7	5	6	7	7
25	20	45	72	7	5	7	9	8
18	41	86	42	6	4	4	4	4
18	41	86	42	6	4	4	4	4
26	20	47	70	7	5	7	9	8
26	21	48	72	7	5	7	9	8
26	22	49	72	7	5	7	9	8
28	20	45	70	7	5	7	9	8
28	21	46	71	7	5	7	7	9
26	26	58	61	7	5	6	7	7
26	26	59	65	7	5	6	9	7
24	22	54	68	7	5	7	7	8
24	26	59	59	7	5	6	5	7
23	41	86	42	6	4	4	4	4
25	20	53	66	7	5	7	5	8

23	41	86	42	6	4	4	4	4
24	21	45	71	7	5	7	7	8
25	26	72	63	7	5	6	9	7
25	20	46	72	7	5	7	9	8
25	21	47	75	7	5	7	9	8
24	22	48	70	7	5	7	9	8
25	20	49	71	7	5	7	9	8
25	20	49	71	7	5	7	9	9
26	23	45	72	7	5	7	9	8
27	26	73	63	7	5	6	7	7
24	20	45	70	7	5	7	9	8
20	41	86	43	6	4	4	4	4
24	21	45	73	7	5	7	9	8
25	20	46	75	7	5	7	9	8
26	22	46	73	7	5	7	9	8
27	23	47	73	7	5	7	9	8
24	24	54	70	7	5	7	9	8
25	20	55	71	7	5	7	9	8
26	28	56	63	7	5	6	7	7
27	20	45	73	7	5	7	9	9

immediate	verbal rete	verbal rete	visual retei	recognitio	MAZE TET-	MAZE TET-	DSST	MMSE	FOLLOW U
5	5	9	4	6	11	12	82	24	
3	4	18	1	4	21	26	79	17	
5	5	11	4	6	15	20	85	25	
6	5	9	6	9	10	19	88	24	
6	5	12	6	8	10	18	89	24	
5	5	9	4	6	11	13	81	25	
7	5	9	6	10	12	12	85	26	
7	5	13	6	8	11	14	85	26	
7	5	13	6	9	10	14	87	25	
6	5	9	6	8	11	14	87	24	
5	5	11	4	7	10	13	81	24	
7	5	9	6	8	10	12	88	25	
7	5	9	6	9	10	12	86	24	
3	4	8	1	4	21	26	79	17	
5	5	9	4	7	11	12	83	25	
6	5	11	6	8	10	13	85	26	
5	5	9	4	6	10	13	84	27	
3	4	8	1	4	21	26	79	17	
3	4	8	1	4	21	26	79	17	
6	5	9	6	8	10	12	90	28	
5	5	9	4	6	10	12	82	29	
3	4	8	1	4	21	26	79	17	
6	5	9	6	8	11	13	86	30	
5	5	11	4	6	12	13	81	30	
7	5	9	6	8	13	14	87	24	
5	5	9	4	6	10	12	82	25	
6	5	12	6	8	11	12	88	24	
5	5	9	4	6	11	12	83	26	
6	5	13	6	9	10	13	87	24	
6	5	13	6	10	10	13	85	24	
5	5	9	4	6	10	13	81	26	
5	5	9	4	6	11	14	82	27	
6	5	12	6	8	10	12	86	25	
5	5	9	4	7	11	14	83	26	
5	5	11	4	7	11	13	84	28	
5	5	9	4	7	13	13	84	28	
6	5	13	6	8	10	14	85	29	
6	5	9	6	9	10	12	86	30	
3	4	8	1	4	21	26	79	17	
6	5	9	6	8	10	12	85	24	
3	4	8	1	4	21	26	79	17	
7	5	11	6	9	10	23	86	29	
7	5	9	6	9	11	17	87	24	
5	5	11	4	6	12	18	83	29	

7	5	12	6	8	13	17	88	30
7	5	9	6	8	11	16	86	26
5	5	11	4	6	12	18	82	27
5	5	9	4	6	13	12	81	28
3	4	8	1	4	21	26	79	17
6	5	13	6	8	11	12	85	29
6	5	11	6	9	10	13	85	30
5	5	9	4	6	10	14	83	26
5	5	9	4	7	10	14	84	26
7	5	9	6	8	11	12	90	25
7	5	9	6	8	11	12	87	24
6	5	9	6	8	11	13	87	24
6	5	11	6	9	10	12	90	25
7	5	9	4	6	10	13	80	26
5	5	11	6	9	10	12	90	25
6	5	11	6	8	11	12	87	25
6	5	11	6	10	12	14	86	25
6	5	9	6	10	13	15	85	30
3	4	8	1	4	21	26	79	17
3	4	8	1	4	21	26	79	17
2	5	11	6	8	10	20	86	28
6	5	9	4	7	11	16	79	26
3	4	8	1	5	21	26	84	17
2	5	11	6	8	12	13	87	27
6	5	11	4	6	11	12	81	26
4	5	10	4	7	10	25	80	26
3	4	8	1	4	21	26	79	17
6	5	9	6	8	11	25	58	27
3	4	8	1	4	21	26	79	17
6	5	11	6	8	12	12	87	26
4	5	10	4	6	13	13	82	25
6	5	9	6	9	11	12	86	26
4	5	9	4	7	11	12	83	27
6	5	9	6	10	10	12	85	28
4	5	10	4	6	10	12	83	27
6	5	9	6	8	10	12	85	27
6	5	12	6	9	11	13	85	26
4	5	10	4	6	10	18	81	24
3	4	8	1	4	21	26	79	17
5	5	9	4	6	11	19	81	25
6	5	10	4	6	12	17	84	24
5	5	11	6	8	13	16	90	26
7	5	9	4	6	11	18	84	24
7	5	9	6	9	10	13	86	26
6	5	9	6	10	11	12	90	25
7	5	9	6	8	12	14	86	30
7	5	11	6	9	11	14	87	24

8	5	11	6	8	10	14	85	26
4	5	9	6	9	13	12	86	25
3	4	8	1	4	21	26	79	17
6	5	10	4	6	11	19	85	27
7	5	9	6	8	10	12	85	28
6	5	11	6	9	11	12	85	25
7	5	9	6	10	10	12	90	30
6	5	13	6	8	11	13	85	29
6	5	11	6	9	11	13	85	24
6	5	11	6	8	11	13	87	26
5	5	11	6	8	10	13	85	24
5	5	9	4	7	11	12	81	25
6	5	11	4	7	12	12	82	24
7	5	13	6	8	11	14	85	25
7	5	11	6	8	10	13	86	26
7	5	9	6	9	10	14	86	26
7	5	9	6	8	10	14	85	24
5	5	9	6	8	10	14	85	24
6	5	10	4	7	11	12	83	25
5	5	11	6	8	11	12	88	26
6	5	10	4	6	11	13	84	27
5	5	11	6	9	11	16	85	28
6	5	11	4	6	11	17	84	26
4	5	9	6	8	13	13	85	24
3	4	8	1	4	21	26	79	17
5	5	13	6	8	11	16	86	26
7	5	11	4	6	12	17	83	25
6	5	9	6	8	13	13	88	27
6	5	13	6	9	10	18	88	28
5	5	11	6	8	10	12	85	24
5	5	9	4	6	10	13	83	25
6	5	9	4	7	11	14	82	26
6	5	9	6	8	11	12	85	24
7	5	11	6	9	12	16	86	25
7	5	9	6	10	13	17	85	26
5	5	9	6	8	10	16	85	26
5	5	10	4	6	11	12	81	25
6	5	9	4	7	13	18	81	24
5	5	10	6	8	14	17	86	27
6	5	11	4	6	12	16	81	28
7	5	9	6	8	10	14	87	27
7	5	12	6	8	10	13	85	24
5	5	11	6	8	10	12	86	27
5	5	9	4	6	11	12	84	26
5	5	9	4	7	11	19	85	30
6	5	9	4	7	11	19	85	30
6	5	13	6	9	13	12	87	28

7	5	11	6	9	13	16	88	28
5	5	9	6	10	12	16	86	24
6	5	9	4	6	10	16	83	25
5	5	9	6	8	10	16	90	26
5	5	9	4	6	10	16	81	27
5	5	10	4	7	10	12	82	28
5	5	11	4	6	10	12	82	24
5	5	9	4	7	10	13	81	25
5	5	11	4	6	11	12	82	26
5	5	9	4	7	10	14	81	26
6	5	11	6	8	11	15	90	25
5	5	9	4	6	10	15	83	24
5	5	9	4	7	11	16	82	26
5	5	9	4	7	13	13	81	28
6	5	12	6	9	10	17	85	30
6	5	12	6	9	10	17	85	30
6	5	13	6	9	10	16	85	30
5	5	9	4	7	11	12	83	29
6	5	9	6	8	12	13	86	28
5	5	11	4	7	12	13	81	29
5	5	11	4	6	10	16	81	26
6	5	11	6	8	11	16	87	26
7	5	11	6	9	11	17	85	25
7	5	9	6	10	13	12	86	25
5	5	9	4	6	13	13	82	24
5	5	9	4	7	13	18	83	26
5	5	11	4	6	10	19	84	27
7	5	11	6	8	10	19	85	28
7	5	10	6	8	10	13	89	29
5	5	10	4	7	10	12	83	30
6	5	9	6	8	10	12	85	24
6	5	10	6	9	10	12	85	24
5	5	9	4	6	11	12	80	26
6	5	11	6	8	11	13	86	25
3	4	8	1	4	21	26	79	17
3	4	8	1	4	21	26	79	17
6	5	9	6	8	12	18	85	26
6	5	11	6	8	12	19	87	26
6	5	11	6	8	12	19	87	26
6	5	9	6	8	14	19	88	28
6	5	11	6	8	14	19	88	28
5	5	9	4	6	15	18	84	26
5	5	11	4	6	15	18	84	26
6	5	9	6	8	11	13	90	24
5	5	9	4	6	11	14	80	24
3	4	8	1	4	21	26	79	17
6	5	9	6	8	12	15	85	25

3	4	8	1	4	21	26	79	17
6	5	12	6	8	12	16	85	24
5	5	9	4	6	10	13	82	25
6	5	11	6	8	11	14	86	25
6	5	13	6	9	12	15	86	25
6	5	9	6	8	10	13	87	24
6	5	9	6	9	11	14	87	25
6	5	9	6	8	11	14	87	25
6	5	11	6	8	12	15	88	26
5	5	9	4	8	12	13	83	27
6	5	11	6	6	13	17	89	24
3	4	8	2	4	21		79	17
6	5	12	6	8	11	13	85	24
6	5	13	6	9	11	14	85	25
6	5	12	6	8	12	15	86	26
6	5	11	6	9	11	16	86	27
6	5	9	6	8	12	13	87	24
6	5	9	6	9	13	14	87	25
5	5	11	4	6	10	15	80	26
6	5	11	6	8	10	16	89	27

TMTA	TMTB	PGI MEMC	remote m	recent me	mental bal	attention a	delayed re	immediate	verbal rete
25	58	61	7	5	6	7	7	5	5
42	87	33	5	3	3	3	3	2	3
26	72	63	7	5	6	7	7	5	5
23	46	71	7	5	7	9	8	6	5
23	45	74	7	5	7	9	9	6	5
28	58	61	7	5	6	7	7	5	5
23	47	73	7	5	7	9	8	7	5
22	45	76	7	5	7	9	9	7	5
20	45	76	7	5	7	9	8	7	5
21	46	70	7	5	7	9	8	6	5
26	59	64	7	5	6	7	7	5	5
23	48	71	7	5	7	9	8	7	5
20	46	73	7	5	7	9	9	7	5
42	87	33	5	3	3	3	3	2	3
26	62	64	7	5	6	7	9	5	5
24	49	71	7	5	7	9	7	6	5
26	68	61	7	5	6	7	7	5	5
42	87	33	5	3	3	3	3	2	3
42	87	33	5	3	3	3	3	2	3
23	55	71	7	5	7	9	9	6	5
25	72	61	7	5	6	7	7	5	5
43	88	24	4	2	2	2	2	1	2
23	45	70	7	5	7	9	8	6	5
29	45	63	7	5	6	7	7	5	5
22	46	71	7	5	7	9	8	7	5
26	59	61	7	5	6	7	7	5	5
20	48	73	7	5	7	9	8	6	5
26	73	61	7	5	6	7	7	5	5
20	45	75	7	5	7	9	8	6	5
21	45	77	7	5	7	9	9	6	5
26	59	61	7	5	6	7	7	5	5
27	67	61	7	5	6	7	7	5	5
20	45	74	7	5	7	9	9	6	5
26	73	62	7	5	6	7	7	5	5
28	71	64	7	5	6	7	7	5	5
29	74	62	7	5	6	7	7	5	5
21	45	74	7	5	7	9	8	6	5
23	46	71	7	5	7	9	8	6	5
42	87	33	5	3	3	3	3	2	3
23	47	68	7	5	7	7	8	6	5
42	87	33	5	3	3	3	3	2	3
23	45	74	7	5	7	9	8	7	5
22	46	73	7	5	7	9	9	7	5
25	59	63	7	5	6	7	7	5	5

23	45	74	7	5	7	9	8	7	5
21	46	71	7	5	7	9	8	7	5
26	67	63	7	5	6	7	7	5	5
26	64	61	7	5	6	7	7	5	5
42	87	33	5	3	3	3	3	2	3
21	45	74	7	5	7	9	8	6	5
22	45	74	7	5	7	9	9	6	5
25	62	61	7	5	6	7	7	5	5
26	69	62	7	5	6	7	7	5	5
21	49	69	7	5	7	7	8	7	5
22	48	72	7	5	7	9	9	7	5
23	46	70	7	5	7	9	8	6	5
24	46	74	7	5	7	9	9	6	5
26	63	64	7	5	7	7	7	7	5
21	46	71	7	5	6	9	8	5	5
23	48	72	7	5	7	9	8	6	5
20	47	74	7	5	7	9	8	6	5
21	49	73	7	5	7	9	9	6	5
43	88	24	4	2	2	2	2	1	2
43	88	24	4	2	2	2	2	1	2
20	45	65	7	4	5	9	8	2	5
26	64	64	7	5	7	7	7	6	5
42	87	33	5	3	3	3	3	2	3
21	45	63	7	5	5	9	5	2	5
26	65	67	7	5	7	7	9	6	5
29	66	62	7	5	6	7	7	4	5
42	87	33	5	3	3	3	3	2	3
23	49	67	7	5	7	9	5	6	5
42	87	33	5	3	3	3	3	2	3
24	45	69	7	5	7	9	5	6	5
28	67	62	7	5	6	7	8	4	5
22	45	72	7	5	7	9	9	6	5
26	68	63	7	5	6	7	9	4	5
20	46	73	7	5	7	9	9	6	5
29	69	61	7	5	6	7	7	4	5
23	49	70	7	5	7	9	8	6	5
24	45	75	7	5	7	9	9	6	5
28	58	61	7	5	6	7	7	4	5
43	88	24	4	2	2	2	2	1	2
27	71	61	7	5	6	7	7	5	5
29	73	63	7	5	6	7	7	6	5
24	49	71	7	5	7	9	8	5	5
29	74	63	7	5	6	7	7	7	5
21	54	72	7	5	7	9	8	7	5
23	55	73	7	5	7	9	9	6	5
22	46	72	7	5	7	9	9	7	5
24	47	75	7	5	7	9	9	7	5

21	48	75	7	5	7	9	9	8	5
21	49	70	7	5	7	9	9	4	5
42	87	33	5	3	3	3	3	2	3
29	51	63	7	5	6	7	7	6	5
23	49	71	7	5	7	9	8	7	5
22	48	73	7	5	7	9	8	6	5
24	55	73	7	5	7	9	8	7	5
21	45	74	7	5	7	9	8	6	5
20	46	73	7	5	7	9	8	6	5
24	47	72	7	5	7	9	8	6	5
23	46	71	7	5	7	9	8	5	5
25	72	62	7	5	6	7	7	5	5
26	73	65	7	5	6	7	7	6	5
20	47	75	7	5	7	9	8	7	5
23	48	73	7	5	7	9	8	7	5
21	49	73	7	5	7	9	9	7	5
24	50	71	7	5	7	9	8	7	5
24	50	69	7	5	7	9	8	5	5
28	68	64	7	5	6	7	7	6	5
22	51	71	7	5	7	9	8	5	5
27	64	63	7	5	6	7	7	6	5
23	52	73	7	5	7	9	9	5	5
28	63	64	7	5	6	7	7	6	5
20	54	69	7	5	7	9	9	4	5
42	87	33	5	3	3	3	3	2	3
21	45	74	7	5	7	9	9	5	5
26	73	65	7	5	6	7	7	7	5
24	46	71	7	5	7	9	9	6	5
23	45	76	7	5	7	9	9	6	5
22	45	71	7	5	7	9	8	5	5
26	73	61	7	5	6	7	7	5	5
27	48	63	7	5	6	7	7	6	5
21	45	71	7	5	7	9	9	6	5
20	46	75	7	5	7	9	9	7	5
23	45	73	7	5	7	9	8	7	5
20	47	69	7	5	7	9	8	5	5
26	74	62	7	5	6	7	7	5	5
27	62	63	7	5	6	7	7	6	5
21	48	71	7	5	7	9	9	5	5
28	63	64	7	5	6	7	7	6	5
24	46	72	7	5	7	9	9	7	5
20	45	74	7	5	7	9	8	7	5
21	47	71	7	5	7	9	8	5	5
26	64	61	7	5	6	7	7	5	5
27	65	62	7	5	6	7	7	5	5
27	66	63	7	5	6	7	7	6	5
23	45	75	7	5	7	9	8	6	5

21	46	75	7	5	7	9	9	7	5
20	47	72	7	5	7	9	9	5	5
27	67	64	7	5	6	7	9	6	5
24	48	68	7	5	7	9	7	5	5
26	68	63	7	5	6	7	9	5	5
28	69	65	7	5	6	7	9	5	5
26	70	63	7	5	6	7	7	5	5
28	71	62	7	5	6	7	7	5	5
27	72	63	7	5	6	7	7	5	5
25	70	62	7	5	6	7	7	5	5
24	49	72	7	5	7	9	8	6	5
28	73	61	7	5	6	7	7	5	5
27	74	62	7	5	6	7	7	5	5
26	63	62	7	5	6	7	7	5	5
20	45	74	7	5	7	9	8	6	5
20	45	74	7	5	7	9	8	6	5
20	45	75	7	5	7	9	8	6	5
29	64	62	7	5	6	7	7	5	5
21	46	71	7	5	7	9	9	6	5
26	65	64	7	5	6	7	7	5	5
27	66	63	7	5	6	7	7	5	5
22	47	73	7	5	7	9	9	6	5
21	46	74	7	5	7	9	8	7	5
21	47	74	7	5	7	9	9	7	5
26	67	61	7	5	6	7	7	5	5
29	68	62	7	5	6	7	7	5	5
27	69	63	7	5	6	7	7	5	5
22	48	73	7	5	7	9	8	7	5
23	49	72	7	5	7	9	8	7	5
28	70	63	7	5	6	7	7	5	5
20	45	70	7	5	7	9	8	6	5
20	46	73	7	5	7	9	9	6	5
26	57	61	7	5	6	7	7	5	5
20	45	72	7	5	7	9	8	6	5
42	87	33	5	3	3	3	3	2	3
42	87	33	5	3	3	3	3	2	3
20	47	70	7	5	7	9	8	6	5
21	48	72	7	5	7	9	8	6	5
22	49	72	7	5	7	9	8	6	5
20	45	70	7	5	7	9	8	6	5
21	46	71	7	5	7	7	9	6	5
26	58	61	7	5	6	7	7	5	5
26	59	65	7	5	6	9	7	5	5
22	54	68	7	5	7	7	8	6	5
26	59	59	7	5	6	5	7	5	5
42	87	33	5	3	3	3	3	2	3
20	53	66	7	5	7	5	8	6	5

42	87	33	5	3	3	3	3	2	3
21	45	71	7	5	7	7	8	6	5
26	72	63	7	5	6	9	7	5	5
20	46	72	7	5	7	9	8	6	5
21	47	75	7	5	7	9	8	6	5
22	48	70	7	5	7	9	8	6	5
20	49	71	7	5	7	9	8	6	5
20	49	71	7	5	7	9	9	6	5
23	45	72	7	5	7	9	8	6	5
26	73	63	7	5	6	7	7	5	5
20	45	70	7	5	7	9	8	6	5
42	87	33	5	3	3	3	3	2	3
21	45	73	7	5	7	9	8	6	5
20	46	75	7	5	7	9	8	6	5
22	46	73	7	5	7	9	8	6	5
23	47	73	7	5	7	9	8	6	5
24	54	70	7	5	7	9	8	6	5
20	55	71	7	5	7	9	8	6	5
28	56	63	7	5	6	7	7	5	5
20	45	73	7	5	7	9	9	6	5

verbal rete	visual rete	recognitio	Maze Tet1	MAZE TET	DSST	MMSE	FOLLOW UP
9	4	6	11	12	82	24	
7	1	3	22	27	78	16	
11	4	6	15	20	85	25	
9	6	9	10	19	88	24	
12	6	8	10	18	89	24	
9	4	6	11	13	81	25	
9	6	10	12	12	85	26	
13	6	8	11	14	85	26	
13	6	9	10	14	87	25	
9	6	8	11	14	87	24	
11	4	7	10	13	81	24	
9	6	8	10	12	88	25	
9	6	9	10	12	86	24	
7	1	3	22	27	78	16	
9	4	7	11	12	83	25	
11	6	8	10	13	85	26	
9	4	6	10	13	84	27	
7	1	3	22	27	78	16	
7	1	3	22	27	78	16	
9	6	8	10	12	90	28	
9	4	6	10	12	82	29	
6	1	2	23	28	77	15	
9	6	8	11	13	86	30	
11	4	6	12	13	81	30	
9	6	8	13	14	87	24	
9	4	6	10	12	82	25	
12	6	8	11	12	88	24	
9	4	6	11	12	83	26	
13	6	9	10	13	87	24	
13	6	10	10	13	85	24	
9	4	6	10	13	81	26	
9	4	6	11	14	82	27	
12	6	8	10	12	86	25	
9	4	7	11	14	83	26	
11	4	7	11	13	84	28	
9	4	7	13	13	84	28	
13	6	8	10	14	85	29	
9	6	9	10	12	86	30	
7	1	3	22	27	78	16	
9	6	8	10	12	85	24	
7	1	3	22	27	78	16	
11	6	9	10	23	86	29	
9	6	9	11	17	87	24	
11	4	6	12	18	83	29	

12	6	8	13	17	88	30
9	6	8	11	16	86	26
11	4	6	12	18	82	27
9	4	6	13	12	81	28
7	1	3	22	27	78	16
13	6	8	11	12	85	29
11	6	9	10	13	85	30
9	4	6	10	14	83	26
9	4	7	10	14	84	26
9	6	8	11	12	90	25
9	6	8	11	12	87	24
9	6	8	11	13	87	24
11	6	9	10	12	90	25
9	4	6	10	13	80	26
11	6	9	10	12	90	25
11	6	8	11	12	87	25
11	6	10	12	14	86	25
9	6	10	13	15	85	30
6	1	2	23	28	77	15
6	1	2	23	28	77	15
11	6	8	10	20	86	28
9	4	7	11	16	79	26
7	1	3	22	27	78	16
11	6	8	12	13	87	27
11	4	6	11	12	81	26
10	4	7	10	25	80	26
7	1	3	22	27	78	16
9	6	8	11	25	58	27
7	1	3	22	27	78	16
11	6	8	12	12	87	26
10	4	6	13	13	82	25
9	6	9	11	12	86	26
9	4	7	11	12	83	27
9	6	10	10	12	85	28
10	4	6	10	12	83	27
9	6	8	10	12	85	27
12	6	9	11	13	85	26
10	4	6	10	18	81	24
6	1	2	23	28	77	15
9	4	6	11	19	81	25
10	4	6	12	17	84	24
11	6	8	13	16	90	26
9	4	6	11	18	84	24
9	6	9	10	13	86	26
9	6	10	11	12	90	25
9	6	8	12	14	86	30
11	6	9	11	14	87	24

11	6	8	10	14	85	26
9	6	9	13	12	86	25
7	1	3	22	27	78	16
10	4	6	11	19	85	27
9	6	8	10	12	85	28
11	6	9	11	12	85	25
9	6	10	10	12	90	30
13	6	8	11	13	85	29
11	6	9	11	13	85	24
11	6	8	11	13	87	26
11	6	8	10	13	85	24
9	4	7	11	12	81	25
11	4	7	12	12	82	24
13	6	8	11	14	85	25
11	6	8	10	13	86	26
9	6	9	10	14	86	26
9	6	8	10	14	85	24
9	6	8	10	14	85	24
10	4	7	11	12	83	25
11	6	8	11	12	88	26
10	4	6	11	13	84	27
11	6	9	11	16	85	28
11	4	6	11	17	84	26
9	6	8	13	13	85	24
7	1	3	22	27	78	16
13	6	8	11	16	86	26
11	4	6	12	17	83	25
9	6	8	13	13	88	27
13	6	9	10	18	88	28
11	6	8	10	12	85	24
9	4	6	10	13	83	25
9	4	7	11	14	82	26
9	6	8	11	12	85	24
11	6	9	12	16	86	25
9	6	10	13	17	85	26
9	6	8	10	16	85	26
10	4	6	11	12	81	25
9	4	7	13	18	81	24
10	6	8	14	17	86	27
11	4	6	12	16	81	28
9	6	8	10	14	87	27
12	6	8	10	13	85	24
11	6	8	10	12	86	27
9	4	6	11	12	84	26
9	4	7	11	19	85	30
9	4	7	11	19	85	30
13	6	9	13	12	87	28

11	6	9	13	16	88	28
9	6	10	12	16	86	24
9	4	6	10	16	83	25
9	6	8	10	16	90	26
9	4	6	10	16	81	27
10	4	7	10	12	82	28
11	4	6	10	12	82	24
9	4	7	10	13	81	25
11	4	6	11	12	82	26
9	4	7	10	14	81	26
11	6	8	11	15	90	25
9	4	6	10	15	83	24
9	4	7	11	16	82	26
9	4	7	13	13	81	28
12	6	9	10	17	85	30
12	6	9	10	17	85	30
13	6	9	10	16	85	30
9	4	7	11	12	83	29
9	6	8	12	13	86	28
11	4	7	12	13	81	29
11	4	6	10	16	81	26
11	6	8	11	16	87	26
11	6	9	11	17	85	25
9	6	10	13	12	86	25
9	4	6	13	13	82	24
9	4	7	13	18	83	26
11	4	6	10	19	84	27
11	6	8	10	19	85	28
10	6	8	10	13	89	29
10	4	7	10	12	83	30
9	6	8	10	12	85	24
10	6	9	10	12	85	24
9	4	6	11	12	80	26
11	6	8	11	13	86	25
7	1	3	22	27	78	16
7	1	3	22	27	78	16
9	6	8	12	18	85	26
11	6	8	12	19	87	26
11	6	8	12	19	87	26
9	6	8	14	19	88	28
11	6	8	14	19	88	28
9	4	6	15	18	84	26
11	4	6	15	18	84	26
9	6	8	11	13	90	24
9	4	6	11	14	80	24
7	1	3	22	27	78	16
9	6	8	12	15	85	25

7	1	3	22	27	78	16
12	6	8	12	16	85	24
9	4	6	10	13	82	25
11	6	8	11	14	86	25
13	6	9	12	15	86	25
9	6	8	10	13	87	24
9	6	9	11	14	87	25
9	6	8	11	14	87	25
11	6	8	12	15	88	26
9	4	8	12	13	83	27
11	6	6	13	17	89	24
7	1	3	22	27	78	16
12	6	8	11	13	85	24
13	6	9	11	14	85	25
12	6	8	12	15	86	26
11	6	9	11	16	86	27
9	6	8	12	13	87	24
9	6	9	13	14	87	25
11	4	6	10	15	80	26
11	6	8	10	16	89	27