MINI-MENTAL STATE EXAMINATION IN NON-HOSPITALIZED POST COVID PATIENTS USING TO IDENTIFY COGNITIVE DECLINE

By

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A thesis submitted to the School of Pharmacy in partial fulfillment of the requirements for the degree of
Bachelor of Pharmacy (Hons.)

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Declaration

It is hereby declared that,

1. The thesis submitted is my/our own original work while completing degree at Brac University.

2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.

3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.

4. I/We have acknowledged all main sources of help.

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Approval

The thesis titled "Mini-mental state examination in non-hospitalized post covid patients to identify cognitive decline" submitted by Silvia Tanjum (Student ID: 18346091) of Summer 2022, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy.

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Abstract

The WHO referred to the SARS-CoV-2 illness as COVID-19, an acronym for "coronavirus disease 2019." After an infection has cleared up, some individuals have experienced temporary or even long-lasting cognitive problems. Patients with SARS-CoV-2 infections are included in this. Many of these individuals, including those with mild disease, have reported deficits in attention, executive functioning, language, processing speed, and memory, which are collectively referred to as "brain fog" symptoms. This cognitive impairment syndrome significantly increases the morbidity of post-Covid-19 diseases along with the prevalence of anxiety, sadness, sleep disorders, and fatigue. Therefore, we performed the MMSE test to determine whether or not non-hospitalized post-covid individuals experience cognitive decline. The study's eligibility parameters called for participants to be over 25 and non-hospitalized post-covid patients. Following this MMSE exam, it is evident that post-COVID individuals who were not hospitalized will not experience any cognitive decline in the future. Because Their average score, according to the results, was 29.1851. It is really almost on the spot. We may not have detected any cognitive deterioration in the patient because we only tested a small number of people.

Keywords: Covid-19; Cognitive decline; mini mental state examinations; dementia; non-hospitalized covid patient.

Dedication

In honor of the School of Pharmacy, Brac University.

Acknowledgements

Table of Contents

List of Table

List of Acronyms

CNS- Central Nervous System

BBB- Blood Brain Barrier

SARS- CoV2- Severe Acute Respiratory Syndrome Coronavirus 2

AD – Alzheimer's Disease

NVUs- Neurovascular Units

Chapter 1:

Introduction

1.1 Background

A new coronavirus known as severe acute respiratory syndrome coronavirus 2 is the source of the ailment known as coronavirus disease 2019 (COVID-19) (SARS-CoV-2) formerly called 2019-nCoV). On December 31, 2019, it was initially reported to the WHO. The WHO labelled the COVID-19 outbreak a worldwide health emergency on January 30, 2020. People of all ages actually affected by corona virus. But mostly the people who are middle-aged and older are affected by this virus. The people who got affected by corona virus some of them were hospitalized and some were non-hospitalized. People who had least risk were non-hospitalized. It's also called Quarantine. One of the most prevalent CNS comorbidities of COVID-19 is Alzheimer's disease. The necessity for caregivers for AD management contrasts with that of COVID-19 since COVID-19 is highly contagious and its management necessitates isolation and quarantine. Due to COVID-19, AD patients, their caregivers, families, society, and the economy are all subject to an increased burden. Patients with dementia have been more heavily burdened than the general population during the COVID-19 pandemic. patients with dementia have a higher mortality rate from COVID-19. The frequency of dementia has dramatically increased worldwide over the last few decades. Over 50 million people worldwide already live with dementia, and by 2050, that number is expected to rise to 152 million as the world's population ages. Alzheimer's disease and other dementias are detectable by the Mini-Mental State Examination (MMSE) in patients with mild cognitive impairment. if there is cause to believe you might be disoriented, including following a head injury or during a sudden illness episode, like an infection. It is occasionally used to help determine whether a person has dementia or another form of cognitive impairment.

1.2 Research gap

As there is no such study regarding determination of cognitive decline among non-hospitalized post covid patients through mini mental state examination, so We attempt to determine the cognitive decline of non-hospitalized post covid patient in comparison with normal people.

There have been instances of encephalitis, thrombotic events, and brain invasion, which further demonstrate how SARS-CoV2 directly affects the brain. Loss of taste and smell is, in fact, a warning symptom of sickness. Additionally, the brain is impacted by organ failure in other parts of the body (such as the heart or lungs), and hypoxemia, a sign of a severe infection, can itself cause cerebral edema and brain dysfunction. We anticipated that pre-existing dementia, particularly with involvement of the brain's blood vessels (vascular dementia), predisposes individuals to greater risk of morbidity and mortality from COVID19 because of these frequent brain problems and autopsy findings. We thus investigated the claim that patients with cognitive decline are more vulnerable to unfavorable outcomes after contracting an infection (Wang QuanQiu, 2021).

1.3 Objectives of the study

This paper we attempted to identify the cognitive impairment of non-hospitalized covid patient if any.

1.4 Significance of the study

50 million individuals globally, including 5.8 million Americans over 65, are thought to be suffering from Alzheimer's disease (AD) and associated dementias (Wang QuanQiu, 2021).

According to research of more than 6 million individuals 65 and older, older persons who were infected with COVID-19 have a much-increased risk—up to 50% to 80% higher than a control group—of acquiring Alzheimer's disease within a year (Health & welness,2022). So, this paper is trying to find out the significant percentage difference of developing dementia / Alzheimer's disease between non-hospitalized post covid patient and non-covid people through mini mental state examination.

Moreover, we can also determine how much severe the dementia can be for non-hospitalized covid patient and non-covid people. If they have any significant difference or not. Lastly, most of the paper or articles are mainly talked about the risk factors or developing dementia for covid patient or the impact of covid on elderly adults with cognitive decline but here the author will try to find out the cognitive impairment of non-hospitalized covid patient and non-covid people. The author will find out the severity of developing dementia by using mini mental state examinations.

Chapter 2:

Methodology

2.1 Patients selection

The criteria for choosing study participants were that they had to be non-hospitalized post covid patients and older than 25 years of age. Every person who took part in the survey freely and sincerely expressed interest in the results responded to the questions. They all met the standards of the poll, which included being over 25 and non-hospitalized post covid patients.

2.2 Research design

The study's goal is to examine post-covid patients in Bangladesh who are not hospitalized. There is a wide range of ages represented among the 30 covid patients who voluntarily completed the study, from 25 to 70 and beyond. The study had a total of 30 individuals. The study's objective was to determine whether patients with post-covid cognitive decline appeared. There were 10 normal patients to different the percentage between non-hospitalized post covid patients and normal people. The age of normal people was more than 25.

2.3 Data collection

Through mini mental state examination, the survey has been done. Going manually to the patient the survey has been done some social platform like Facebook, Messenger, WhatsApp. Google meet are also been used for the survey. It was a hand written survey. Patients are asked

some question and did marking based on their answer. In mini mental state examinations 11 questions are there and total mark is 30. In this survey, participations were completely voluntary. 30 non- hospitalized covid patients and 10 normal people replied to the survey. In the end 40 replies were collected for analysis. The survey was administered between 2nd January to 2nd February 2023.

2.4 Data analysis

Excel file was used for all data collection. The average of all patients and standard deviation was done using excel file.

Chapter 3:

Literature reviews

3.1 Covid - 19 and neurological complications

SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) infection began suddenly and violently, and SARS was present at the same time. Corona viral disease (COVID-19) has recently spread globally as a pandemic. Diverse organs have been affected by the virus's ability to mutate, disseminate, and enter the body in different ways. As a result, patients experience a variety of symptoms and indications. Neurological symptoms such anosmia, agnosia, stroke, paralysis, cranial nerve deficits, encephalopathy, meningitis, delirium, and seizures are common issues that affect the course of the illness and its management. In this analysis, specific attention was paid to studies that addressed the acute or chronic neurological manifestations in COVID 19 patients who might exhibit acute symptoms. (Hosseini. Nasrin, Nadjafi. Shabnam & ashtray, Behnaz at el., 15 feb, 2021).

3.2 Mental health issues during and after covid 19

Since the COVID-19 pandemic has been ongoing for more than a year, neurological consequences, including effects on the central nervous system (CNS) that are direct and indirect , have been identified as post-COVID-19 sequelae. There is a ton of evidence that COVID-19 sufferers have neurological, cognitive, and emotional problems. Among those infected with SARS-CoV-2, acute neurological symptoms like neuroinflammation, cognitive decline, loss of smell, and brain stroke are frequent direct outcomes. Numerous factors,

regardless of age, including work-related stress, lockdowns, social isolation, and quarantine in response to contain SARS-CoV-2 have a negative impact on the mental health of huge populations. Individuals and communities have been impacted public health emergencies, which have led to strong emotions and bad behaviors.

3.3 Covid-19 and cognitive impairment

Although COVID-19 was once thought to be a respiratory condition, there is mounting evidence that SARS-CoV-2 can infect COVID-19 patients' brains and impair cognition. According to reports, The olfactory, trigeminal, optic, and vagus nerves are only a few of the cranial nerves that SARS-CoV-2 may invasively affect. Infected nerve terminals, retrograde transport, and trans synaptic transmission have also been proposed as potential factors in the spread of SARS-CoV-2 to various brain regions. The blood-brain barrier (BBB), which also serves as a physical barrier between nerve cells and immune system circulating cells and controls the passage of chemicals between the blood and brain parenchyma, is made up of the neurovascular units (NVUs) that line the brain's microvasculature. Therefore, both direct and indirect interactions between SARS-CoV-2 and the brain during blood circulation may depend on the BBB. In this review, we evaluated the possibility of neuroinvasion in the context of the SA" infection as well as the potential effects of BBB dysfunction on cognitive decline (Yanting, Chen at el., 2022)

3.4 Mini-mental state examination performance correlated with estimated premorbid cognitive ability

Premorbid cognitive ability in individuals with clinical diagnoses and prior cognitive ability in healthy aging are both estimated using tests requiring the pronunciation of irregular words. The

Mini-Mental State Examination (MMSE), a popular screening test for potential cognitive disease, and the results of these word-reading tests do, however, correlate with one another. This study sought to determine if childhood 1Q or schooling were responsible for the connections between word-reading tests and MMSE scores in healthy older adults. (D. Dykiert at el., sep 2016)

3.5 How corona virus affects to our brain

The coronavirus might first enter your body through your mouth, nose, or eyes. Following that, it passes through the trachea and enters the lungs, where it may enter the bloodstream and affect the respiratory system. The immune system reacts to this threat by releasing a hail of cytokine-producing cells and substances. This condition is known as inflammation in medicine. Blood clots might be made easier to form as a result. Blood veins get narrowed by clots, making it difficult for blood to flow freely, which reduces blood supply to the heart and other organs, including the brain, where it can cause brain cells to die. In the worst cases, it can lead to a stroke. Even yet, there are other factors that can be dangerous besides low oxygen levels. Inflammation can damage the brain's protective layer, making the organ more vulnerable to damage. The blood-brain barrier gives the brain a secure environment. The blood-brain barrier is a biological barrier that allows some chemicals, cells, and nutrients to enter and exit the brain (Spudich & Nath, 2022). Effectively preventing dangerous substances and contagious germs from entering the brain is the blood-brain barrier. The coronavirus can infect the endothelium, a layer of cells that serves as protection.

Chapter 4:

Result and Discussion

4.1 Participants characteristics

From non-hospitalized 30 covid patients 23 were male and 7 were female. And all normal people were female.

Table 1: Male and female participation rates

Gender	Frequency	Percentage
Male	23	76.67
Female	7	23.33
Total	30	100

4.2 Average and standard deviation of non- hospitalized covid patients

Average of all participants non hospitalized covid 19 participants. Average of all 30 participants Are 29.1851.

Standard deviation of all 30 participants is 2.6958869.

Table: Average and standard deviation of non-hospitalized post covid patients :

Serial of the patient	Ques 1	Ques 2	Ques 3	Ques 4	Ques 5	Ques 6	Ques 7	Ques 8	Ques 9	Ques 10	Ques 11	Total
1	5	5	3	5	3	2	1	3	1	1	1	30
2	5	5	3	1	3	2	1	3	1	1	0	25
3	5	5	3	5	3	2	1	3	1	1	1	30
4	5	5	3	5	3	2	1	3	1	1	1	30
5	5	5	3	5	2	2	1	3	1	1	1	29
6	5	5	3	5	3	2	1	3	1	1	1	30
7	5	5	3	5	3	2	1	3	1	1	0	29
8	5	5	3	0	1	2	0	1	1	1	0	17
9	5	5	3	5	3	2	1	3	1	1	1	30
10	5	5	3	5	3	2	1	3	1	1	1	30
11	5	5	3	5	3	2	1	3	1	1	1	30
12	5	5	3	5	3	2	1	3	1	1	1	30
13	5	5	3	5	3	2	1	3	1	1	1	30
14	5	5	3	5	3	2	1	3	1	1	1	30
15	5	5	3	5	3	2	1	3	1	1	1	30
16	5	5	3	5	3	2	1	3	1	1	0	29
17	5	5	3	5	3	2	1	3	1	1	1	30
18	5	5	3	5	3	2	1	3	1	1	1	30
19	5	5	3	5	3	2	1	3	1	1	0	29
20	5	5	3	5	3	2	1	3	1	1	1	30
21	5	5	3	5	3	2	1	3	1	1	1	30
22	5	5	3	5	3	2	2	3	1	1	1	30
23	5	5	3	5	3	2	1	3	1	1	1	30
24	5	5	3	5	3	2	1	3	1	1	1	30
25	5	5	3	5	3	2	1	3	1	1	1	30
26	5	5	3	5	3	2	1	3	1	1	1	30
27	5	5	3	5	3	2	1	3	1	1	1	30
28	5	5	3	5	3	2	1	3	1	1	1	30
29	5	5	3	5	3	2	1	3	1	1	1	30
30	5	5	3	5	3	2	1	3	1	1	1	26
Average value												29.1851
Standard deviation												2.6958869

4.3 Average and standard deviation of normal people

As all of normal people were female so the percentage of then were 100. Average of all normal people are 10. Standard deviation is 0.

Table: Average and standard deviation of normal people:

Serial Of the patient	Ques 1	Ques 2	Ques 3	Ques 4	Ques 5	Ques 6	Ques 7	Ques 8	Ques 9	Ques 10	Ques 11	Total
1	5	5	3	5	3	2	1	3	1	1	1	30
2	5	5	3	5	3	2	1	3	1	1	1	30
3	5	5	3	5	3	2	1	3	1	1	1	30
4	5	5	3	5	3	2	1	3	1	1	1	30
5	5	5	3	5	3	2	1	3	1	1	1	30
6	5	5	3	5	3	2	1	3	1	1	1	30
7	5	5	3	5	3	2	1	3	1	1	1	30
8	5	5	3	5	3	2	1	3	1	1	1	30
9	5	5	3	5	3	2	1	3	1	1	1	30
10	5	5	3	5	3	2	1	3	1	1	1	30
Average value												30
Standard Deviation												0

4.4 Discussion

From the result we can clearly see that the average is close to the total participants. The patients hardly have some problem. They don't have any major issues. In MMSE there have a chart the interpretation of the severity of patients.

Table: Interpretations of severity of patients:

Method	Score	Interpretation
Severity	24-30	No cognitive impairment
Severity	18-23	Mild cognitive impairment
Severity	0-17	Severe cognitive impairment

As the average of non-hospitalized post covid patient is 29.1851. So, from the chart we can clearly see that the participants have no cognitive impairment. Out of 30 20 of them got 30 out of out marks. One of them are female whose age is 75. She got 17 out of 30 marks. She has some memory problem. That's why she could not give answers of some questions.

Chapter 5:

Conclusion & Limitations

5.1 Conclusion

To sum up, we can say by doing this survey that non-hospitalized covid patient has no potential to have cognitive decline in future. And normal people also not have any possibility to have cognitive decline in future. As 30 people took part in this MMSE test which was carried out both online and offline. Sometimes patients can not recall some events but for normal people they can easily answer or recall all the information they have ask Despite the acute infection's remission, COVID-19 is associated with clinically severe symptoms (i.e., post-COVID-19 syndrome). One of the most prevalent and incapacitating symptoms of post-COVID-19 syndrome is fatigue, followed by cognitive impairment. So, by doing this survey we can clearly see that the non-hospitalized patients do not show any cognitive decline. It may because of the participants was small. If we can do this same survey with a grater population like 200-300, we may get some cognitive decline to the patients. The participants were not that much aged. One

of them were old like her age was 70 or above. In that case her total marks were low. So, age

has a great impact in this survey.

5.2 Limitations

The study has several limitations. Firstly, the study's sample size was small, to start. If the

participants were large, we might get more correct answer which could help us more. Secondly,

there was no information on cognitive performance prior to infection. Finally, the study may

include selection bias, which prevents it from being generalized.

5.3 Future recommendations

- Though there is no neurological complications seen in patients so physical and mental
  health conditions should monitor by the physician.
- In healthcare ministry there should have database of all covid patients for their further
  follow-up.

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Appendix:

Mini mental state examination

Project name: Determination of cognitive decline in non-hospitalized post covid patient through mini mental state examinations in comparison with normal people.

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Patient's Name: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ Date: ⎯⎯⎯⎯

⎯⎯⎯⎯

1. "What year is it? Season? Date? time of the week? Month?" (5)

2. "Where are we at this point: State? County? Town/city? Hospital? Floor?" (5)

3. After clearly and carefully naming three unrelated things, the examiner asks the patient to name all three of them. For scoring, the patient's answer is utilised. If feasible, the examiner repeats them until the patient understands them all. There have been _____ trials. (3)

4. "I want you to count backwards from one hundred by sevens." (93, 86, 79, 72, 65, …) After five responses, stop. Or "Spell WORLD backwards" is one alternative. (D-L-R-O-W) (5)

5. "I gave you the names of three objects earlier. Can you describe those for me? (3)

6. Ask the patient to name two basic objects you are holding out, like a watch and a pencil.(2)

7. Say it again: "No ifs, ands, or buts." (1)

8. Fold the paper in half and place it on the ground with your right hand. (The examiner hands a piece of blank paper to the patient.) (3)

9. Please read this and follow the instructions. The written command is "Close your eyes." (1)

10. "Make a sentence up and write it about anything." (This clause must start with a noun and end with a verb.) (1)

11. Please duplicate this image. (The examiner instructs the patientto draw the symbol below on a piece of blank paper. Two of the angles must intersect, and all ten must be present.) (1)