PREVALENCE OF NEUROLOGICAL DYSFUNCTION IN COVID-19 RECOVERED PATIENTS OF VADODARA DISTRICT.

[1]DR. SHIVANI I. SOLANKI, [2]DR. RUSHIKESH K.JOSHI, [3] DR. BHUMIKA S. PATEL

[1]MPT Scholar KSPR, KPGU, Vadodara, [2] Assistant professor, KSPR, KPGU, Vadodara, [3]MPT Scholar KSPR, KPGU,Vadodara.

[1]MPT in Neurological & Psychosomatic Disorders,

[1]Krishna School of Physiotherapy & Rehabilitation (KSPR), KPGU, Vadodara, Gujarat

Abstract: This study has been undertaken to determine the prevalence of neurological dysfunction in COVID-19 recovered patients of Vadodara district. **Background:** Three outbreaks connected to newly emerging coronaviruses have been distinguished in the last two decades. The COVID-19 pandemic brought attention to the SARS CoV-2 infection's , it's neurological side effects and increased concern about coronaviruses' potential neuropathogenicity. The objective of this review was to give a brief overview of whether the COVID-19 infection results in any neurological impairment? We are using neurological impairment for this purpose. **Aim :** To Determine The Prevalence Of Neurological Dysfunction In Covid-19 Recovered Patients Of Vadodara District. **Methodology:** 147 patient were included in the study depending on the inclusion and exclusion criteria .This subjects were asked to fill the NIS scale depending on the symptoms and severity. Depending on the data collected statistical analysis was done using percentage frequency to determine the neurological dysfunction encountered by patients post COVID. **Result:** Results showed that most of the patients showed neurological involvement post COVID-19 in which most likely had an impact on the QoL ratings on the Neurological Impairment Scale (NIS), particularly those related to the "MOTOR," "TONE/JOINT RANGE," "COGNITIVE FUNCTION" , "MOOD" , "FATIGUE" and "pain/discomfort" domains.

Keywords: COVID-19 , Neurological Dysfunction , SARS CoV-2, Infection, Neurological Impairment Scale (NIS) , Patients

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory syndrome (SARS) caused by the SARS-CoV-2 coronavirus **(Hugon, J.,2022, Maury, A.,2021, Chen, Y.,2021)**.WHO declared that SARS-CoV-2 was the reason behind COVID-19 episode**(Jafari, Z.,2022).** on 3 october 2020 the pandemic affected more than 34 million confirmed cases worldwide and caused over millions of death **(Maury, A.,2021)**.

The virus has continued to spread since the first cases of COVID-19, a disease connected to SARS-CoV-2, were discovered in China in December 2019.(**Maury, A.,2021)** Coronavirus sickness 2019 was then given to the newly discovered acute respiratory illness (COVID-19). The COVID-19 epidemic in China quickly turned into a pandemic, putting a strain on healthcare and the global economy**(Román, G. C.,2020, Pezzini, A.,2020)**

More than 34 million instances have been reported as of October 3, 2020.(**Maury, A.,2021**) Severe covid-19 has many risk factors. Age, male sex, obesity, smoking, and concomitant chronic illnesses such as hypertension, type 2 diabetes mellitus, and others are all key risk factors for severe COVID-19 disease **(Divani, A. A., 2020)** COVID-19 is a new corona virus that most likely originated in animals and is currently quickly spreading from human from person to person**(Filatov, A.,2020).**

COVID-19 induces fever and respiratory symptoms similar to pneumonia in the vast majority of patients. GI problems, dermatological signs, and cardiovascular events are some of the less common symptoms that have been recorded**(Román, G. C.,2020)** Other signs and symptoms include ,cough, shortness of breath, weariness, anosmia, and hypogeusia , anorexia, myalgia, dyspnea, chest tightness, sputum production, hemoptysis, sore throat, diarrhea, nausea, vomiting, and abdominal/back discomfort.**(Chen, Y.,2021, Pezzini, A.,2020)** Fatigue affects more than half of COVID-19 patients who recover**(Ortelli, P., 2020)**Although, Anosmia, ageusia, and headache were the most prevalent neurological complaints in COVID-19, more serious problems such as stroke, impairment of consciousness, convulsions, and encephalopathy were also recorded**(Sharifian-Dorche, M.,2020)**

Beside all this, COVID-19 has been shown to have Neurological Dysfunction including the Central Nervous System (CNS), Peripheral Nervous System (PNS), and muscle, as well as early olfactory and gustatory changes. Neurological Dysfunction refers to a disorder of the Central Nervous System and affects the efficiency of brain processes. Besides respiratory disease ,there are many research determining neurological dysfunction in COVID-19 patients. Coronavirus reaches the CNS via the olfactory bulb during a nasal infection, causing inflammation and demyelination.[10]Beside all this there are not efficient studies conducted on determining the prevalence of neurological dysfunction in COVID-19 recovered patients**(Maury, A.,2021)**

Therefore, the aim of this study is to determine the prevalence of neurological dysfunction in COVID-19 recovered patients in Vadodara District, using the neurological impairment scale. The NIS is a measure of severity of Neurological Impairment across a broad range of disabling conditions. The NIS was created to assess the severity of neurological damage in a wide range of illnesses. The evidence for its scaling qualities, reliability, and concurrent and predictive validity came from this first assessment of its psychometric properties**(Turner-Stokes, L.,2014)**

The NIS was created as a tool to assess the degree of neurological damage in a variety of illnesses. This initial look at its psychometric features has yielded some interesting results to set proof for its scalability, dependability, and concurrent and parallel processing capabilities validity prediction A large multicenter sample revealed two unique principal components, according to exploratory factor analysis. As a result, a 10-item physical subscale was developed , as well as a 7-item cognitive impairment sub-scale was developed each with a reasonable level of internal consistency**(Turner-Stokes, L.,2014) .**The purpose of the study is to determine the prevalence of neurological dysfunction in covid-19 recovered patients of vadodara district.

METHODOLY

• **STUDY SITE:** Vadodara District

• **STUDY DESIGN:** Analytical Cross-sectional Study

• **STUDY DURATION**: 10 – 12 months after the approval from Ethical Committee.

• **STUDY POPULATION** : COVID-19 recovered patients of Vadodara District

INCLUSION CRITERIA:

a. Only those patients were included who were willing to participate in the study

COVID- 19 recovered patients of Vadodara District.

b. MALE and FEMALE

c. AGE GROUP :18 years – 60 years

d. COVID-19 recovered patients of Vadodara District referred by physicians ,

pulmonologists and chest physicians. Also, local residents diagnosed with COVID-19 (with positive reports),

were included in the study

EXCLUSION CRITERIA:

a. Patients with history of any Neurological Dysfunctions before COVID-19 infection.

b. Any disabilities which was restricting individuals from participating in the study.

SAMPLE SIZE:

a. The sample size was 147 , the sample size was calculated using

www.statulator.com

b. Based on the previous study conducted by Meena Lanjiwar et.al. , neurological

manifestations observed in COVID-19 patients was 24.8%.

c. Keeping α error of 0.05(:95% confidence level) & β error of 0.2 (:80% power) and

absolute precision of 7%, the calculated sample size was 147

MATERIAL TO BE USED:

a.   Neurological Impairment Scale

b.   Pen

c.   Consent

METHOD :

1. In this study the demographic data of the COVID-19 recovered patients of Vadodara District referred by Physicians, Pulmonologists and Chest Physicians, also the local residents diagnosed with COVID-19 (with positive reports),were included in the study.

2. We explained the patients about our study and asked them to fill the consent form if they were willing to be the part of the study .

3. We used NEUROLOGICAL IMPAIRMENT SCALE (NIS version 8), which comprises of 17 items(each rated 0-3 according to severity). NIS is measure of severity of Neurological Impairment across a broad range of disabling conditions was measured by NIS Scale.

4. The patients were requested to fill the circle according to the impairment and severity

5. According to the form filled the outcome were measure

Outcome measures:
NEUROLOGICAL IMPAIRMENT SCALE (NIS)

The scale consist of 17 items related to neurological impairments.

• 17 items mapped on the scale are:

i. MOTOR

ii. TONE/JOINT RANGE

iii. SENSATION

iv. PERCEPTUAL FUNCTION

v. SPEED AND LANGUAGE

vi. COGNITIVE FUNCTION

vii. BEHAVIOUR

viii. MOOD

ix. SEEING AND VISION

x. HEARING

xi. PAIN

xii. FATIGUE

Ethical clearance was obtained from the Institutional Ethical Committee of KPGU, Vadodara prior to the study. The whole procedure of the study was explained to all the subjects and patient information sheet was given to participants. A written informedconsent of all the subjects were taken prior to the study.

STATISTICAL ANALYSIS

• Data was calculated using standardized questionnaire

• All collected forms were filled and access was restricted to researchers only.

• Data was entered in Microsoft Excel Worksheet 2007.

• Data was crosschecked for any data entry errors.

• Descriptive statistics will be presented as : Qualitative data as frequency /percentage

, quantitative data as mean and standard deviation (SD) with 95% confidence

interval (CI) for normative distribution or median and inter quartile range (IQR) for non - normative

distribution-data.

RESULTS

According to the inclusion criteria, 147 COVID-19 recovered individuals were recruited for the research. The accompanying chart 1.1 ,1.2 ,1.3 displays the neurological involvement of 147 samples, broken down by domains.

SCORES	MOTOR	TONE/JOINT RANGE	SENSATION	PERCEPTUAL FUNCTION
NONE	45	74	138	143
MILD	58	28	3	4
MODE-RATE	43	43	6	0
SEVERE	1	2	0	0

TABLE 1.1

SCORES	SPEECH AND LANGUAGE	COGNITIVE FUNCTION	BEHAVIOUR	MOOD
NONE	141	54	103	75
MILD	4	42	36	41
MODE-RATE	0	51	8	31
SEVERE	0	0	0	0

TABLE 1.2.

| SCORES	SEEING /VISION	HEARING	PAIN	FATIGUE	OTHERS
NONE	130	123	64	56	120
MILD	15	10	34	29	9
MODERATE	2	4	42	57	16
SEVERE	0	0	8	5	2

TABLE 1.3
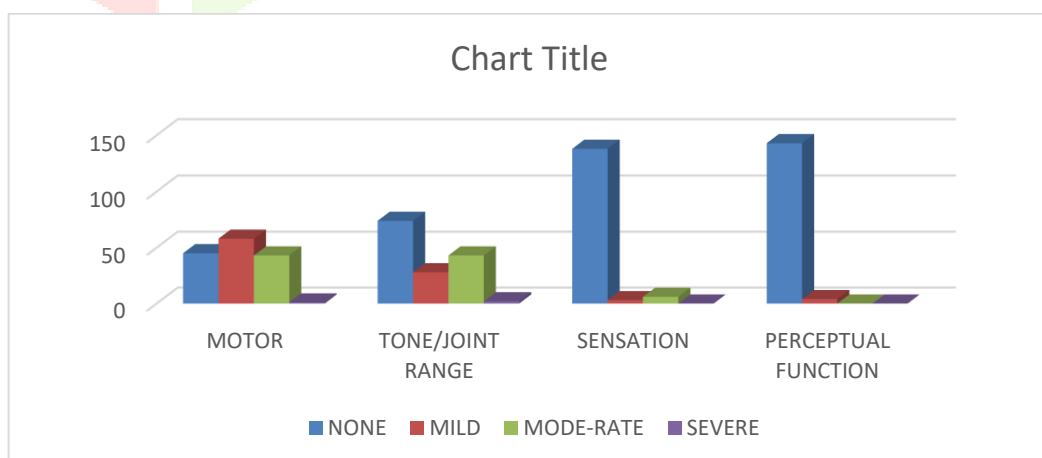
GRAPH 2.1 : The graph shows the involvement of "MOTOR", "TONE/JOINT RANGE", "SENSATION", "PERCEPTUAL" Dysfunction in COVID-19 Recovered patients based on the severity of individuals.
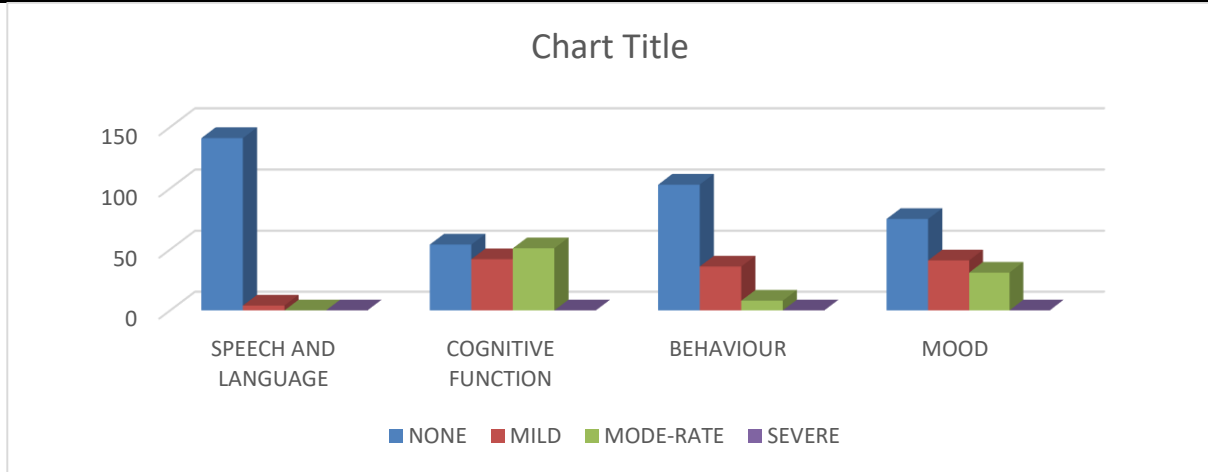
GRAPH 2.2: : The graph shows the involvement of "SPEECH &LANGUAGE", "COGNITIVE", "BEHAVIOUR", "MOOD" Dysfunction in COVID-19 Recovered patients based on the severity of individuals.
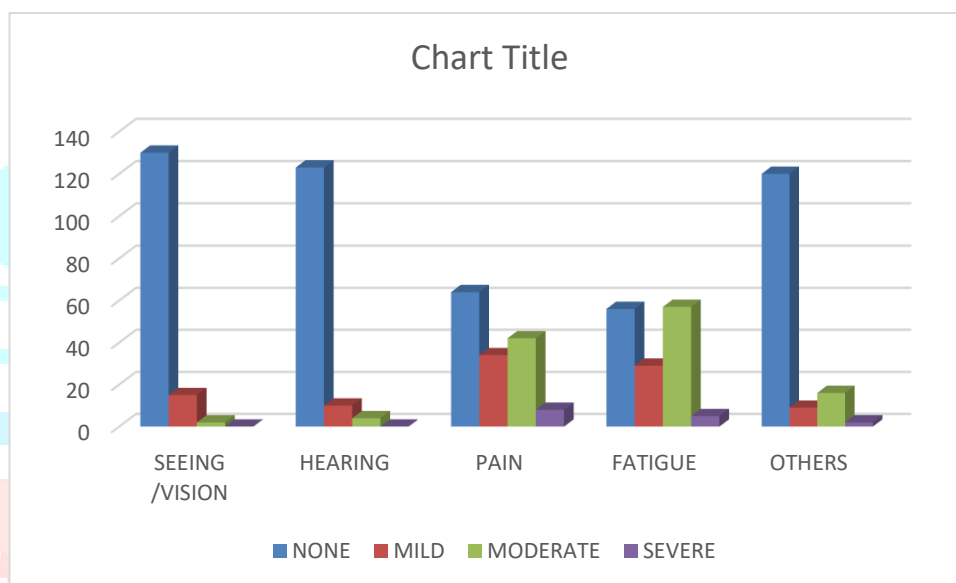
GRAPH 2.3: The graph shows the involvement of "SPEECH &LANGUAGE", "COGNITIVE", "BEHAVIOUR", "MOOD" Dysfunction in COVID-19 Recovered patients based on the severity of individuals

DISCUSSION:

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory syndrome (SARS) caused by the SARS-CoV-2 coronavirus which since December 2019 has affected several million confirmed cases worldwide . Even though COVID-19 has diminished, it has left behind a significant health burden, ranging from issues like early fatigue, headaches, and high cholesterol to severe neurological and psychiatric conditions like encephalopathy, stroke, Alzheimer's disease, neuropathies, depression, and mood swings, confusions, and damage to the cortico-spinal tract, Guillain Barré syndrome etc **(Helms, J., 2020, Garg, R., 2020)**.

A study by Rishu Garg et al showed 106 (27.1%) out of 391 patients had recently developed neurological symptoms, regardless of when those symptoms first appeared in the patient's history. The three neurological complaints that were most prevalent in these 106 individuals were headache (22.6%), altered taste (33.1%), and altered smell. Nonetheless, 38 (9.7%) of the patients recognized neurological symptoms as their illness's

first sign. Before the start of respiratory symptoms or fever, the average time for neurological symptoms was 2 Plus /minus 1.57 days**(Garg, R., 2020)**.

Numerous articles and studies have suggested an association between neurological complications and the recently discovered SARS-CoV-2 virus that produces COVID-19. Both the peripheral and central nervous systems may be affected by these problems. The neurological manifestations could be non-specific, like a headache, altered mental status, or myalgia, or they could be more specific diseases and syndromes that need urgent medical attention**(Mao,L.,2020, Huang,C.,2020, Carfi,A.,2020)** , but there haven't been enough research done to determine whether or not those who have experienced COVID-19 are experiencing neurological impairments / dysfunctions

Hence, we are conducting a study that aims to ascertain the prevalence of neurological dysfunction in COVID -19 recovered patients of the Vadodara district using the neurological impairment scale as a screening tool that can help us to find neurological and psychological issues. This study will add more value to previous research and help determine whether or not people are still dealing with health conditions after COVID-19.

NIS is a self-report, paper-and-pencil test that was created as a tool for psychometric evaluations and as a gauge for the severity of neurological impairment in a range of incapacitating disorders .This aids in a) identifying neurological symptoms beyond those that may be discovered through a clinical interview or neurological testing, and b) focusing on certain treatments. The best way to utilise NIS in clinical settings is as a complement to thorough neurological or neuropsychological evaluation batteries or as an intake measure.

NIS is designed to be used by people with COVID-19 who are between the ages of 18 and 60. Despite the fact that the NIS was primarily intended to be a self-report, NIS observer report form is available that will allow family members and significant others to provide their opinions of the neurological symptoms they have been able to manage since COVID.

The NIS form should only take 5 to 10 minutes to complete, while patients with severe neurological and cognitive disorders may need more time. The Neurological Impairment SCALE (NIS) was created as a gauge for the degree of neurological damage in a variety of incapacitating illnesses. This initial analysis of its psychometric attributes has offered proof of its scalability, dependability, concurrent validity, and predictive validity.

A 10-item sub-scale of physical impairment and a 7-item sub-scale of cognitive impairment, both with adequate internal consistency, were identified by exploratory factor analysis in a large multicenter sample. Due to the high percentage of zero scores in this sample, the "Hearing" and "Other" items did not load on either factor. Even while this could imply some item redundancy, when certain impairments(such as hearing, convulsions, and pressure sores) do arise, they have the potential to significantly affect rehabilitation. They have thus been kept on the scale due to their clinical significance.

The instrument has developed into an ordinal measure of impairment with potential use in a variety of neurological diseases. There are 17 items in the NIS (the NIS-version 8 tested here) (each rated 0–3 where 0 means none ,1 means mild , 2 means moderate , 3means severe).

In this cohort of patients with a history of confirmed COVID-19 infection, the data from this research show a high prevalence of enduring and incapacitating symptoms. By proving that significant sequelae are not only

present in people who had extremely severe acute COVID-19 infection, this study expands on the findings of Carfi et al and their work**(Carfì, A.,2020)**.

Increased levels of exhaustion, shortness of breath, and weakness were widespread and likely had an impact on the QoL ratings on the Neurological Impairment Scale (NIS), particularly those related to the "MOTOR," "TONE/JOINT RANGE," "COGNITIVE FUNCTION" , "MOOD" , "FATIGUE" and "pain/discomfort" domains.

Patients may feel very anxious and alone if they have long-lasting symptoms that aren't yet identified by any diagnostic model. Clinicians are encouraged to recognize the existence of persistent symptoms because they may have an adverse effect on the health and wellbeing of PCS patients. Regardless of the severity of the acute infection or the patient's previous health, patients often experience persistent symptoms after contracting COVID-19. These symptoms are incapacitating and common.

As more is learned about the potential for COVID-19 infection to result in long- term health effects in healthy people, it is more crucial than ever to encourage suppression and prevention measures. To identify specific symptom clusters and predictors linked to PCS and to develop efficient interventional strategies, more in-depth research is needed.

Conclusion:

SARS-CoV-2 may have neurological manifestations in addition to respiratory tract symptoms. Commonest symptoms like weakness , cognitive dysfunction, mood swing, fatigue, musculoskeletal/neuropathic/pain due to spasticity may be enquired post COVID-19.We observed that neurological symptoms were common among older adults and those who were suffering from COVID-19 infection more than once . Also it was observed that pressure sores , aggression ,motor dysfunction , cognitive dysfunction were common among those who had long hospital stays.

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