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COGNITIVE FUNCTION ANALYSIS USING TELEPHONE-MOCA ON RESIDENT WITH POST COVID-19 INFECTION IN DR. MOEWARDI HOSPITAL 2020-2021

Befrie Mahaztra Sudarman¹, Rivan Danuaji²

Correspondence: drbefrie@gmail.com

¹Resident of Neurology, Faculty of Medicine Sebelas Maret University, Surakarta, Indonesia.

²Staff of Neurology Department of Sebelas Maret University, Surakarta, Indonesia.

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ABSTRACT

Introduction: Individuals after Covid-19 infection are thought to have symptoms of cognitive impairment that can manifest as difficulties with concentration, memory, receptive language and/or executive function. Researchers wanted to use the telephone version of the MoCA-22 assessment to assess cognitive function..

Methods: The cross-sectional study was located at Dr Moewardi Hospital, Surakarta. Researchers assessed cognitive function telemedicine using Telephone-MoCA 22 (T-MoCA 22) and then compared it with the 30-point Standard MoCA-INA examination. The difference between the two assessments is in the visuo-executive and naming components. The analysis is continued on the results of the inspection of each component.

Results: During the duration of January 2020-December 2021 there were 191 Residents who were infected with Covid-19. After screening, 69 people were able to complete the study, of which 34 people with a history of Covid-19 infection (49.2%) and 35 people (50.8%) without a history of Covid-19 infection. The subjects consisted of 34 men (49.2%); 35 women (50.8%); age range 25-33 (± 28.97) years; The education level of the resident is 28 juniors, 27 intermediates, and 17 seniors; In the regression test, it was found that the effect of Covid-19 history on cognitive function with p value = 0.94 if using MoCA 30, and p value = 1.17 if using T-MoCA 22. Comparative test of the two assessments obtained p value = 0.475. In the analysis of each component obtained less than the maximum value on the components of calculation, repetition and delayed memory.

Conclusion: In the study, it was found that a history of Covid-19 infection had no effect on cognitive function in research subjects tested using MoCA-INA or Telephone-MoCA. T-MoCA examination has a test value that is not significantly different from the full version of MoCA 30 points

Keywords: Covid-19, Cognitive, Telephone-MoCA, MoCA-INA

Introduction

Covid-19 is an infectious disease caused by Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2), formerly known as 2019-novel coronavirus (2019-nCoV), which first appeared on December 31, 2019 in Wuhan, China, and eventually caused a worldwide pandemic and was designated a global health emergency in early 2020. Symptoms of COVID-19 vary widely from asymptomatic to acute respiratory distress and multiorgan dysfunction.¹ The severity of COVID-19 symptoms depends on the host inflammatory response.²

There is lots of evidence that individuals with severe COVID-19 disease may have persistent symptoms in addition to the initial symptoms of the disease, including sub-acute and chronic phase symptoms. This symptom is often referred to as "long covid", there are reports of "brain fog" with broad psychological symptoms such as lack of energy, impaired concentration, disorientation, and difficulty finding the right

words.² Cognitive impairment can occur with or without fluctuations, including brain fog, which can manifest as difficulty with concentration, memory, receptive language and/or executive function.³

Given the recent developments in technology and lifestyle, there is a need to establish the validity of telephone screening, especially in the era of the COVID-19 pandemic. This is especially so when doctors and researchers alike turn to consultations as well as remote procedures. The MoCA Phone (T-MoCA) resulted in a total score of a maximum of 22 points, eliminating MoCA-30 items that required visual stimulation or the use of paper and pencil. Researchers want to use the telephone version of the MoCA-22 assessment to analyze cognitive function using Telephone-MoCA on resident doctors after Corona Virus Disease-19 infection at Dr. Moewardi Hospital for the 2020-2021 period.

Methods

A. TYPE, PLACE AND TIME OF RESEARCH

This research is a type of cross-sectional research. This research was conducted through retrieval in the medical record room of RSUD Dr Moewardi and the process of assessing cognitive function through telephone calls. After obtaining data from medical records and identity data including telephone numbers, the T-MoCA 22 assessment process will be carried out starting on March 15-30, 2022.

B. RESEARCH SUBJECT AND POPULATION

This study was conducted on all Resident Doctors with and without a history of Covid-19 infection at RSUD Dr. Moewardi Surakarta in January 2020 to December 2021. Research subjects were taken according to the Total Sampling method, namely subjects who met the inclusion and exclusion criteria were taken as research subjects. Subjects will be divided into 2 groups, namely a group with a history of positive Covid-19 infection as evidenced by a PCR examination history, and a group without a history of Covid-19 infection.

Inclusion criteria:

1. Over 17 years old
2. Resident Doctor on duty at RSUD Dr. Moewardi in January 2020 to December 2021.
3. Have no complaints related to cognitive function before being diagnosed with Covid-19.
4. Willing to take part in research

Exclusion criteria:

1. Have a history of structural intracranial disease before and after being exposed to Covid-19.
2. In the use of drugs that cause sedation or cognitive impairment.
3. Resident of Neurology study program.

C. SAMPLE

The sample size was calculated using the OpenEpi application, 95% confidence interval, 5% confidence limits. Calculations with the OpenEpi application obtained the required sample size in this study as many as 40.

D. RESEARCH INSTRUMENTS

T-MoCA 22 has a total score of 22 points, eliminating the MOCA-30 item that requires visual aspects and the use of stationery. Given that MoCA outperforms MMSE for detecting mild cognitive difficulties, T-MoCA is a promising measure for use in less impaired samples when remote testing is required. The time used in this test is about 10-15 minutes. The maximum total score obtained is 22 points, a score of 17 < is considered abnormal.

E. DATA COLLECTION AND DATA ANALYSIS TECHNIQUES

In this study, the Kolmogorov-Smirnov test was used to analyze the normality of the data distribution. The analysis was continued with descriptive analysis of each data component. The Spearman test method and the Mann-Whitney test were used if the data distribution was not normal. The degree of significance used in the study was $\alpha = 0.05$.

Results

During the duration of January 2020–December 2021 there were 191 Residents who were infected with Covid-19. After screening and willingness to participate in the study, there were 69 people who were able to complete the study, of which 34 people with a history of Covid-19 infection (49.2%) and 35 people (50.8%) without a history of Covid-19 infection. Subjects consisted of 34 men (49.2%); 35 women (50.8%); age range 25-33 (± 28.97) years; The education level of the residents is 28 juniors, 27 people middle, and 17 seniors. Complete data from the demographics of the subjects can be seen in table 1. The data on the results of the cognitive function examination for each group can be seen in table 2.

Table 1- Demographic Data of Research Subjects

No	Parameter	Covid 19 History (+) (n=34 people)	Covid 19 (-) History (n=35 people)	p value
1.	Gender			0,911
	Man	16 (47,1%)	16 (45,7%)	
	Woman	18 (52,9%)	19 (54,3%)	
2.	Age			0,101
	< 30 tahun	28 (82,3%)	21 (60,0%)	
	≥ 30 tahun	6 (17,7%)	14 (40,0%)	
3.	Resident level			0,802
	Junior	11 (32,3%)	14 (40,0%)	
	Intermediate	14 (41,1%)	13 (37,1%)	
	Senior	9 (26,6%)	8 (22,9%)	
4.	Phone distance			0,448
	28 – 32 Week	19 (55,8%)	16 (45,7%)	
	33 – 37 Week	13 (38,2%)	17 (48,5%)	
	38 – 42 Week	2 (6,0%)	2 (5,8%)	

Table 2 - MoCA and Telephone-MoCA Examination Results

No	Parameter	Covid 19 History (+) (n=34 orang)	Covid 19 History (-) (n=35 orang)	p value each assesment
1.	MoCA 30 Score			0,837
	23	3 (8,8%)	3 (8,6%)	
	24	5 (14,7%)	5 (14,3)	
	25	4 (11,8%)	4 (11,4%)	
	26	5 (14,7%)	7 (20,0%)	
	27	5 (14,7%)	5 (14,3)	
	28	5 (14,7%)	5 (14,3)	
	29	4 (11,8%)	3 (8,6%)	
	30	3 (8,8%)	3 (8,6%)	
2.	T-MoCA 22 Score			0,490
	18	8 (23,5%)	7 (20,0%)	
	19	11 (32,4%)	8 (22,9%)	
	20	6 (17,6%)	9 (25,7%)	
	21	6 (17,6%)	9 (25,7%)	
	22	3 (8,8%)	2 (5,7%)	

In the regression test, it was found that the effect of Covid-19 history on cognitive function with p value = 0.94 if using MoCA 30, and p value = 1.17 if using T-MoCA 22. Comparative test of the two assessments obtained p value = 0.475. In the analysis of each component obtained less than the maximum value on

the components of calculation, repetition and delayed memory. The results of statistical tests can be observed in table 3 as follows.

Table 3 - Test for Differences in Positive and Negative Covid 19 History on various Variables

No	Parameter	p Value
1	MoCA 30 Score	0,837
2	T-MoCA 22 Score	0,490
3	Age	0,101
4	Phone distance	0,448
5	Gender	0,911
6	Resident level	0,802

Table 4 - Differences in Components of a 22 . MoCA Telephone

No	Cognitive Domain	Component Maximum Score (Total 22 Points)	Covid 19 History (+) (n=34 people)		Covid 19 History (-) (n=35 people)	
			Reach Maximum	Not Reach Maximum	Reach Maximum	Not Reach Maximum
1	Number series	2 Points	34 (100%)	0	35 (100%)	0
2	Attention	1 Points	34 (100%)	0	35 (100%)	0
3	Calculation	3 Points	17 (50%)	17 (50%)	19 (54.3%)	16 (45.7%)
4	Repetition	2 Points	24 (70.5%)	10 (29.5%)	25 (71.4%)	10 (28.6%)
5	Fluency	1 Points	34 (100%)	0	35 (100%)	0
6	Abstract ability	2 Points	34 (100%)	0	35 (100%)	0
7	Delayed memory	5 Points	17 (50%)	17 (50%)	21 (60%)	14 (40%)
8	Orientation	6 Points	24 (70.5%)	10 (29.5%)	25 (71.4%)	10 (28.6%)

In table 4, an analysis of each component of the T-MoCA cognitive examination is presented from each domain. It was found that there were several sub-components of the test that decreased from the maximum number, namely the calculation, repetition, delayed memory and orientation components.

Discussion

Our research shows that a history of Covid-19 infection has no effect on cognitive function in study subjects tested using MoCA-INA or Telephone-MoCA. Cognitive impairment in post-infectious or acute inflammatory patients may occur with or without fluctuations, including brain fog, which may manifest as difficulties with concentration, memory, receptive language and/or executive function⁴ Brain fog is related to the severity of respiratory symptoms. Cognitive symptoms related to length of stay and whether or not the patient was intubated. It is still unclear whether the milder cases or not hospitalization also show cognitive impairment⁵ Symptoms of long-covid syndrome, especially brain fog, are similar to those experienced in patients undergoing chemotherapy for cancer (chemo fog or chemo brain), as well as in patients with myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) or mast cell activation syndrome (MCAS).⁶

In one study, the cognitive function of all COVID-19 subjects was evaluated with an iPad-based online neuropsychological test including Digit span, Trail Making Test (TMT), Sign Coding Test (SCT), and Continuous Performance Test (CPT). Blood samples from all patients were collected to examine the inflammatory profile, including interleukin-2 (IL-2), IL-4, IL-6, IL-10, tumor necrosis factor- α (TNF- α), interferon- γ (IFN- γ), and C-reactive protein (CRP). The relationship between cognitive function and inflammatory profile was analyzed by Pearson correlation. Correlation analysis showed that the reaction time of the first and second parts of CPT was positively correlated with CRP levels (r 1/4 0.557 and 0.410, $P < 0.05$)⁷. In conclusion, the findings of the study suggest that

cognitive impairment exists even in patients recovering from COVID-19, and may be related to an underlying inflammatory process. In another study, 71 patients (mean age 61, 75% male), 31 (42%) had delirium, of which only 12 (39%) were recognized by the clinical team. The mean cognitive score at follow-up is still the same.⁸

T-MOCA has a total score of 22 points, eliminating the MOCA-30 item that requires visual aspects and the use of stationery. T-MOCA was initially validated by Pendlebury et al as shown in Table 1. T-MOCA showed adequate sensitivity and specificity in mild cognitive impairment. The optimal sensitivity and specificity for MCI are in the range of scores from 18 to 19. T-MOCA should be seen as a screening rather than diagnostic tool. Mobile version managed T-MOCA is very useful for clinicians when face-to-face assessment is not possible.⁹

In general, T-MoCA does not present the same barriers to access inherent in video conferencing, as individuals can participate via landlines or mobile phones, without the need for more advanced equipment or technological know-how. T-MoCA showed adequate sensitivity and specificity for MCI with area under receiver operating characteristic curve (ROC) ranging from 0.73 to 0.94 in special samples such as in community-dwelling patients after transient ischemic attack (TIA), stroke. or in patients with atrial fibrillation. In this sample, T-MoCA has shown the same sensitivity to identify MCI as Telephone Interviews for Cognitive Status (TICS) which is highly correlated with MMSE.¹⁰

In the study, it was found that a history of Covid-19 infection had no effect on cognitive function in research subjects tested using MoCA-INA or Telephone-MoCA. What is highlighted is that there are several sub-components of the test that have decreased from the maximum number, namely the calculation, repetition, delayed memory and orientation components. Normal results in this study may be possible due to the celestial phenomenon where the examination is too easy for individuals with high intelligence levels so that they cannot describe minor abnormalities. The next important finding is that the T-MoCA examination has a test value that is not significantly different from the full version of MoCA 30 points. So it is possible to develop research with a larger scale and diverse subjects in order to get better research results.

Research Ethics

This research has passed the ethical review of the Health Research Ethics Committee of Dr. Moewardi Surakarta Hospital via registration number S552002001-0467

Author's Statement

The author states that there is no conflict of interest in the process of searching data, processing data, and compiling this research paper.

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