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Assessment of Cognitive Disorders after COVID-19 Infection in Tunisian Patients

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Background

The COVID-19 infection, caused by the coronavirus SARSCOV2, has led to a major health crisis. The respiratory tract is the primary site of the virus which can cause acute lung injury and pulmonary fibrosis with chronic impairment of lung function are the most described sequel in the literature COVID-19 can also damage other organs including the central nervous system (CNS) [1,2]. Studies showed that SARS-CoV-2 infection has a neurotropism, similarly to other coronaviruses [3]. There are, at least, four possible pathogenic mechanisms accounting for the impact of COVID-19 on the CNS: direct viral encephalitis, systemic inflammation, peripheral organ dysfunction (liver, kidneys, lungs), or cerebrovascular changes. In most cases, the neurological signs of COVID-19 may result from a combination of the above factors [4]. Other corona viruses, such as MERS-CoV and SARS-CoV, were also known to cause cognitive dysfunctions [4].

All these arguments account for a possible association between SARS-CoV-2 infection and the presence of cognitive dysfunctions [6,9]. Studies have found cognitive impairments in patients recovering from COVID-19 [5,6]. These symptoms could be part of the "long COVID" cognitive symptoms that persist in the early chronic phase.

Inflammation was involved in the pathogenesis of cognitive disorders. Pro-inflammatory cytokines could play a key role in the development of SARS manifestations [7]. However, cognitive profile in these patients is still not precise and underlying mechanisms are still unknown [5].

Besides, most studies were performed in Western or Asiatic Countries. Very few were performed in African or Arab countries. To our knowledge, this is the first study performed in Tunisia and North Africa. Cognition is tightly connected with patient's cultural context and cognitive profile could be different form one context to another.

The aim of this study was to assess neuropsychiatric and cognitive disorders in Tunisian patients who recovered from COVID-19.

Methods

Study design

A cross-sectional survey was conducted during May and June 2021. This study included patients who were hospitalized for COVID-19 infection in pneumology department in Mongi Slim Hospital in Marsa, Tunisia. They were assessed one month after discharge. Patients with previous severe cognitive impairment were excluded from the study.

Socio-demographic data, clinical data, medical history and COVID-19 infection data were collected from interview and from medical records. The presence of complications during hospitalization (e.g. respiratory, neuro-psychiatric or cardio-vascular complications) was also noted.

Assessment of cognitive impairment was performed using the following scales: mini mental state (MMS) [8], Frontal Assessment Battery (FAB) validated in Tunisia [8], Trail Making Test Part A&B (TMT), and the maze task. These latter tests are culture free. Tests are described in the appendix. Finally, the Hospital Anxiety and Depression (HAD) Scales were administered in order to screen for anxiety and depression symptoms [9].

Study design and tests choice were prepared collaboratively between psychiatrists, neuro-psychologists and pneumology physicians.

All tests were paper and pencil based. This method is more affordable than computer-based tests and can be generalized in middle- and low-income countries.

Four investigators (three psychiatry residents and one neuro-psychologist from mental health department) performed the interviews in the pneumology department on the day of their regular follow up meeting. They were administered the questionnaires in the waiting room before the pneumology appointment.

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences, version 20.0. (SPSS Inc., Chicago, IL, USA). Descriptive analysis was performed to establish the prevalence of cognitive dysfunctions as well as describe the sociodemographic profile of the study population.

Categorical data were analyzed via Pearson's Chi squared test. Continuous data were first assessed if they fulfilled normality assumption before choosing either the Student's T-test or the Mann-Whitney-U-test. Results were considered statistically significant if P-value < 0.05.

Ethical Considerations

The study was approved by the local ethical committee of Mongi Slim Hospital. All participants had clear explanations about the process and the objectives of the study and signed the informed written consent. The investigators protected personal data and confidentiality of participants. Participants were informed that they would not receive the results of their tests because this could induce a perceived morbidity. Patients who asked for psychological care were referred to mental health departments.

Results

Sample size

Twenty patients were included in the study.

Socio-demographic and clinical data

Mean age of patients' sample was 63 and they were mostly males (65%). Main COVID symptoms were asthenia, myalgia, cough and fever. Demographic and medical data are detailed in table 1.

Regarding the complications occurring during hospitalization, twelve patients presented pulmonary bacterial surinfections and 2 patients presented an episode of agitation. There were no cardio-vascular complications. Two patients required intensive care unit and benefited from Non Invasive Ventilation (NIV) during 5 days and 10 days respectively.

Cognitive and psychiatric findings

There were mild rates of depression and anxiety. Patients mean scores on cognitive and psychiatric tests are detailed in Table 2.

Table 1: Demographic and clinical data

Age (mean ± SD) year		63 ± 12.7 (range: 33-81)
Sex (%)	Male Female	65 35
Smokers (%)	Yes No	30 70
BMI (mean ± SD) BMI>30 (%) BMI>35 (%)		28.6 ± 4 (range :21-36) 25 15
Medical history (%)	Diabetes HBP Heart disease Hypothyroidism Stroke	30 30 20 10 5
COVID symptoms (%)	Asthenia and myalgia Cough Fever Digestive symptoms Headache Anosmia and ageusia	85 40 35 20 15 10
Lesions extent on CT scan (mean ± SD) (%)		45.6 ± 20.5 (range: 10-80)
Oxygen needs (mean ± SD) Liters		8.12±4.9 (range:1-15)

SD: Standard Deviation; BMI: Body Mass Index; HBP: High Blood Pressure; CT: Computed Tomography.

Table 2: Scores on cognitive tests.

Tests	min	max	mean
MMS	10	30	25.75
FAB	8	18	14.65
TMT-A	20 sec	309 sec	133.53 sec
TMT-B	41 sec	340 sec	217.11 sec
MAZE test	7 sec	139 sec	59 sec
HAD anxiety	0	18	8
HAD depression	2	14	6.6

Table 3: Cognitive deficits.

Cognitive Test	Patients with impairments
MMS: memory skills	n= 3
FAB: executive functions	n= 8
TMT-B: flexibility	n= 11
MAZE Task: attention and planning functions	n=9

There were 14 patients with at least one cognitive dysfunction, which represents 70% of the sample. Three patients had less than the cut off score on the MMS and 8 patients on the FAB (showing respectively memory and executive impairment). On the TMT and the Maze task, respectively 5 and 9 patients had abnormal timing scores. Those latter tests explore flexibility, attention and planning abilities (Table 3).

Statistical analysis

There was no statistically significant association between the presence of cognitive dysfunction and demographic or clinical parameters. There was no statistical association between depression and anxiety on the one hand and cognitive impairment on the other hand.

Discussion

This study showed the presence of cognitive impairments in Tunisian patients who recovered from COVID-19 and were hospitalized in pneumology department.

Main limitations are the small sample size and the absence of a control group.

There is a difficulty recruiting a control group that was not affected by COVID-19 since most people can have asymptomatic infections and this disease affected nearly all population.

Seventy percent of the sample had cognitive dysfunctions. Several cognitive domains were affected such as flexibility, speed processing, attention and planning functions.

Hampshire et al. Found that COVID-19 had a significant multi-domain impact on cognitive abilities [10]. Zhou et al reported that the cognitive impairments in COVID-19 patients were mild, affected sustained attention, and were correlated with C-Reactive Protein level which is a marker of inflammation [11]. A recent meta-analysis found that COVID-19 affected executive functions, attention, and memory [6]. Cognitive symptoms are more prevalent in patients with severe infection who warranted hospitalization.

Anxiety and depression were not associated with cognitive impairments in the present study. This shows that these impairments are not caused by psychiatric syndromes, which can represent a bias, since depression can also result in cognitive decline.

The physiological mechanisms accounting for long lasting impairments are currently not fully understood and involve several factors. These factors include the systemic inflammatory and consequently the neuro-inflammatory response to the virus. Similarly, chronic systemic inflammation has also been studied as one of the fundamental pathogenic mechanisms involved in the cognitive impairments in neuro-degenerative diseases such as Alzheimer's disease [12]. Besides, the inflammation related with viral infection results in memory impairment. The hippocampus is especially vulnerable to respiratory viral infections, as shown in animal models [3]. Areza-fegyveres et al suggested that hypoxia could account for cognitive impairments [13]. Similar alterations were found in infections due to other coronaviruses. However, cognitive impairments following COVID-19 infection seem to have some atypical features: they may last longer, affect younger people and associate affective symptoms [14].

Regarding the intensive care unit, our sample was not representative with only 2 patients needing Intensive Care and NIV. Both did not have significant cognitive impairment. In the literature, ICU admission and invasive treatments such as ventilation and sedation following acute respiratory distress syndrome are risk factors for cognitive decline [15].

Conclusion

Patients hospitalized with COVID-19 may develop cognitive impairment shortly after discharge. Memory and executive functions are the most affected domains. This pilot study could be a sound basis for future bigger studies in African and Arab cultural context. Screening for cognitive disorders in post COVID is very important for better management of these patients. It can be performed using paper and pencil-based tests for wider use.

References

1. Carsana L, Sonzogni A, Nasr A, et al. Pulmonary post-mortem findings in a series of COVID-19 cases from northern Italy: a two-centre descriptive study. Lancet Infect Dis. 2020; 20: 1135-1140.
2. Dasgupta A, Kalhan A, Kalra S. Long term complications and rehabilitation of COVID-19 patients. Journal of the Pakistan Medical Association. 2020; 70: S131-1135.
3. Jacomy H, Fragoso G, Almazan G, et al. Human coronavirus OC43 infection induces chronic encephalitis leading to disabilities in BALB/C mice. Virology. 2006; 349: 335-346.
4. Rogers JP, Chesney E, Oliver D, et al. Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic. The Lancet Psychiatry. 2020; 7: 611-627.
5. Miners S, Kehoe PG, Love S. Cognitive impact of COVID-19: looking beyond the short term. Alzheimer's Research and Therapy. 2020; 12: 170.
6. Crivelli L, Palmer K, Calandri I, et al. Changes in cognitive functioning after COVID-19: A systematic review and meta-analysis. Alzheimer's Dement. 2022; 1-20.
7. Cothran TP, Kellman S, Singh S, et al. A brewing storm: The neuropsychological sequelae of hyperinflammation due to COVID-19. Journal of Cleaner Production. 2020; 88: 957-958.
8. Bellaj T, Ben Jemaa S, Attia Romdhane N, et al. Version arabe du Mini Mental State Examination (A-MMSE): fidélité, validité et données normatives. Tunis Med. 2008; 88: 768-776.
9. Terkawi A, Tsang S, Alkahtani G, et al. Development and validation of Arabic version of the Hospital Anxiety and Depression Scale. Saudi J Anaesth. 2017; 11: S11-S18.
10. Hampshire A, Trender W, Chamberlain SR, et al. Cognitive deficits in people who have recovered from COVID-19. eClinicalMedicine. 2021; 39: 101044.
11. Zhou H, Lu S, Chen J, et al. The landscape of cognitive function in recovered COVID-19 patients. J Psychiatr Res. 2020; 129: 98-102.
12. Akiyama H, Barger S, Barnum S, et al. Inflammation and Alzheimer's disease. Neurobiology of Aging. 2000; 21: 383-421.

13. Areza-Fegyveres R, Kairalla RA, Carvalho CRR, et al. Cognition and chronic hypoxia in pulmonary diseases. Dement Neuropsychol. 2010; 4: 14-22.
14. Altuna M, Sánchez-Saudinós M, Lleó A. Cognitive symptoms after COVID-19. Neurol Perspect. 2021; 1: S16-S24.
15. Sasannejad C, Ely EW, Lahiri S. Long-term cognitive impairment after acute respiratory distress syndrome: A review of clinical impact and pathophysiological mechanisms. Critical Care. 2019; 23: 352.

Appendix

Cognitive domains and cut-off scores of the cognitive tests

Test	Main cognitive function assessed	Pathological scores
MMS	Memory abilities	<20
FAB	Executive functions	<15
TMT A§B	Flexibility	Part A>78 sec Part B>273 sec or errors
Maze task	Attention and planning abilities	>60 sec

Description of Frontal Assessment Battery (FAB) or the BREF (Batterie rapide d'efficience frontale): FAB is a measure that allows an overall assessment of executive functions. It is composed of 6 subtests (2 cognitive and 4 behavioral) exploring conceptualization, mental flexibility, motor programming, sensitivity to interference, inhibitory control and autonomy from the environment.

Description of TMT (Trail Making Test): TMT is a test of visual attention and task switching. It provides information about speed of processing and mental flexibility.

Description and instructions of The MAZE Test: The Maze Test was developed as a pencil and paper test of attention, visuo-constructional ability, and executive functions of planning and foresight. The participants compete a simple demonstration maze first in order to establish the rule set, then complete the Maze Task. Performance is measured in time (in seconds), using a stop watch, and the total number of errors.