

## Tentamen Suicidi as a Neuropsychiatric Syndrome in Severe COVID-19 Intensive Care Patient with Respiratory Failure: Serial Cases

Suparno Adi Santika<sup>1\*</sup>, Nancy Margarita Rehatta<sup>2</sup>, Christrijogo Sumartono<sup>2</sup>

<sup>1</sup>Resident of Department of Anesthesiology and Intensive Care, Faculty of Medicine, Airlangga University-Dr Soetomo General Hospital, Mayjend Moestopo Street No. 6-8, Gubeng, Surabaya, East Java 60285, Indonesia

<sup>2</sup>Staff of Department of Anesthesiology and Intensive Care, Faculty of Medicine, Airlangga University-Dr Soetomo General Hospital, Mayjend Moestopo Street No. 6-8, Gubeng, Surabaya, East Java 60285, Indonesia

\*Corresponding author details: Suparno Adi Santika; [Balenon234rv@gmail.com](mailto:Balenon234rv@gmail.com)

### ABSTRACT

COVID-19 is pneumonia caused by SARS-CoV-2 infection, that can cause morbidity and mortality in critical patients in the COVID-specific Intensive Care Unit (RICU). Tentamen suicidi is one of the severe neuropsychiatric syndromes which can aggravate the condition of patients with acute respiratory failure. We present 3 cases of patients with suicide trials in severe COVID-19 pneumonia accompanied by acute respiratory failure. Patients with tentamen suicidi experience a gradual worsening of the condition. This complication, especially tentamen suicidi is not well recognized at the beginning of treatment. The conclusion of these serial cases is that tentamen suicidi is one of the severe neuropsychiatric syndromes in a COVID-19 patients with respiratory failure. Early recognition and clinical management of neuropsychiatric syndrome symptoms in COVID-19 pneumonia patients with acute respiratory failure who are intensively treated at the RICU can reduce the risk of morbidity, mortality and improve patient outcomes.

**Keywords:** tentamen suicidi; COVID-19 pneumonia; acute respiratory failure

### INTRODUCTION AND METHODS

COVID-19 is a lower respiratory tract infection, caused by the SARS-CoV-2 virus. The outbreak has become a major global public health concern.<sup>1</sup> The clinical manifestations of SARS-CoV-2 infection appear milder than SARS and MERS infections, but eventually present higher morbidity and mortality due to hyperinflammatory reactions and acute respiratory failure.<sup>2</sup> About 10-15% of COVID-19 patients with mild symptoms will progress to severe and about 15-20% of severe COVID-19 cases will develop into a critical condition and many of these patients require more intensive care in intensive care (ICU).<sup>3</sup> The majority of patients were admitted to ICU due to acute hypoxemic respiratory failure that required respiratory support.<sup>4</sup> Acute respiratory failure is the main cause of death in a patient with COVID-19.<sup>5</sup> Especially, ARDS in older patients (>65 years) with comorbidities are at increased risk of death.<sup>6</sup>

Some studies report of COVID-19 from Wuhan, mortality rates among those admitted to ICU ranged from 52-62% and increased to 86-97% among those requiring invasive mechanical ventilation.<sup>5,6,7,8</sup>

Cytokine storm or uncontrolled systemic inflammatory response due to release of proinflammatory cytokines and chemokines by immune effector cells is the main feature of ARDS.<sup>9</sup>

Although this virus infects the respiratory tract that is associated with pulmonary manifestations, COVID-19 is also associated with neuropsychiatric complications that include suicide trials, delirium, and psychosis.

Neuropsychiatric complications of COVID-19 especially suicide trials might be profound.<sup>10</sup> There are suggestions that suicide rates in COVID-19 will rise. Suicide will become a more pressing concern in this pandemic as neuropsychiatric syndromes. The etiology of suicide trials in COVID-19 is still not clear and maybe multifactorial, including psychosocial and organic factors.<sup>11</sup>

Neurotropism and neuro-invasive characteristics in various strains of coronavirus might be resulting in neuro and psychological consequences in a subset of the COVID-19 affected population.<sup>12</sup> This case series highlight the importance of vigilance towards suicide trial in severe COVID-19 intensive care patient with respiratory failure.

### CASES

Nine patients undergoing intensive care for COVID-19 at Dr. Soebandi Hospital Jember were observed, monitored, and treated according to definitive and intensive-supportive COVID-19 therapy at the RICU (Respiratory Intensive Care Unit) for the same length of the treatment period, with a typical rating scale. Early COVID-19 in EWS (Early Warning Score) > 7 and signs of Acute Respiratory Failure were confirmed by BGA (Blood Gas Analysis) and Oxygen Saturation at the beginning of admission to RICU. Intensive care was carried out with routine maintenance carried out by the FASTHUG-BIDS protocol and SOFA-QSOFA Scoring once at the start of treatment and APACHE II / 24 hours. The RICU nurse assessed the level of agitation (anxiety) and cognition of the patient using the CAM-ICU and the Richmond Agitation Sedation Score (RASS).

After the ICU treatment, the patient was treated in a regular ward for covid-19 patients.

The gender of the patients was mostly male (5 Male, 4 Female), the oldest age was 72 years and the youngest age was 39 years. Of all patients who were serialized in this case, 4 out of 9 were geriatric patients (40%). The comorbidities found in the patient were hypertension (5 patients), diabetes mellitus (6 patients), and obesity (3 patients) but no history of previous psychiatric disorders was found.

All patients received antihypertensive therapy during treatment. Five patients received antidiabetic therapy and all patients received oxygen therapy according to Covid-19 Acute Respiratory Failure clinical practice guideline protocol applied in the hospital. The length of stay at the RICU is 10 to 17 days and 3 patients died during treatment and 5 patients had completed treatment and returned to the non-Covid general ward after the condition improved, while 1 patient was being treated until the writing of this serial case was carried out on the 13th days.

**TABLE 1:** Admission demographic RICU patients (according to EWS)

Name	Gender	BMI	Age	SaO2	P/F Ratio Pre-Admission	Comorbid
LEE	Male	37,1	60	87% NRBM	147	Diabetes Hypertension
YUR	Female	22,6	59	92% NRBM	212	Hypertension Asthma
HEP	Female	32,9	36	90% NRBM	176	Diabetes
SPJ	Male	36,6	62	90% NRBM	143	Obesities
SNJ	Female	21,1	38	91% NRBM	189	Hypertension
PUR	Female	33,2	34	89% NRBM	176	Diabetes Hypertension
NMH	Female	21,6	54	82% NRBM	98	Diabetes Hypertension Obesities
NRM	Male	34,4	46	88% NRBM	105	Obesities
KOK	Male	26	68	91% NRBM	232	Diabetes

Calculation of body mass index (BMI) shows three patients are in the normal category (18.5-24.9), one patient is in the overweight / pre-obese category (25-29.9), and five patients are in the obese category. Patients suffering from hypertension received anti-hypertensive drug therapy with a target of normal blood pressure therapy (systolic <120 mmHg and/or diastolic <80 mmHg) as many as two patients, an increase in blood pressure (systolic 120-129 mmHg and or diastolic <80 mmHg) as much as two patients and stage 3 hypertension (systolic >160 mmHg

and/or diastolic >100 mmHg) in three patients. All patients presented with a specific complaint of shortness of breath, with a history of high fever, some of whom were accompanied by swallowing pain which was exacerbated by clinical signs of rhonchi in all lung fields, and a severe non-productive cough. Chest X-ray examination showed a diffuse infiltrate with several features of Ground Glass Opacities (GGO) and two patients with cardiomegaly with Cardiac-Thoracic Ratio (CTR) 61%, 57%, and 59% (LEE, NMH, and PUR).

**TABLE 2:** Clinical Data on Pulmonary and Cardiac Functions During RICU Treatment Patients Associated with Severe Neuropsychiatric Syndrome.

Name	APACHE	Systolic (mmHg)	Diastolic (mmHg)	Heart Rate	MAP (mmHg)	SpO2	Chest Signs and Radiology
LEE	(18)→25%	133-176	92-133	91-146	106-147	84-91%	Rhonchi, Infiltrate Bilateral, GGO
YUR	(14)→15%	123-189	89-136	87-129	100-154	89-95%	Rhonchi, Infiltrate Bilateral, GGO
HEP	(9) → 8%	94-148	76-110	79-127	82-123	90-96%	Rhonchi, Infiltrate Bilateral
SPJ	(13)→15%	102-133	79-105	83-118	87-114	90-97%	Rhonchi, Infiltrate Bilateral
SNJ	(17)→25%	147-179	93-135	107-131	111-150	85-94%	Rhonchi, Infiltrate Bilateral
PUR	(14)→15%	149-177	82-116	78-92	104-136	89-96%	Rhonchi, Infiltrate Bilateral
NMH	(21)→40%	138-192	102-144	109-176	114-160	77-91%	Rhonchi, Infiltrate Bilateral CA → RJP 1x
NRM	(20)→40%	106-133	78-105	103-122	87-114	83-92%	Rhonchi, Infiltrate Bilateral CA → DNR
KOK	(18)→25%	109-147	83-102	89-94	92-117	91-94%	Rhonchi, Infiltrate Bilateral

In advance of treatment, patients who were treated with severe and deteriorating symptoms both in physical and psychological conditions were characterized by various increases in hemodynamic parameters and decreased oxygen saturation, experiencing fluctuating conditions. These patients had a worsening prognosis varying from 15%, 25%, to 40% when assessed by the APACHE II clinical predictive score. Two patients died after previously being scored with a score > 20 and the percentage of worsening prognosis was 40%.

Meanwhile, one patient died after undergoing a suicide trial and disconnecting the ventilator hose, even though he had received a restrain, and took advantage of the condition of the nurse who had changed PPE. It appears in the observation that a decrease in oxygen saturation, an increase in pulse, an increase in breathing frequency, is triggered by several things that arise rapidly, progressively and if it decreases by itself, without manipulation, both medical administration and nursing actions will also return to normal in a short time (1 -2 hours). As shown in the following table.

**TABLE 3:** Clinical Observation Data (APACHE-SOFA-CAM ICU-RASS), Subjective and Objective monitoring.

Name	APACHE	SOFA	CAM ICU	RASS	Subjective	Objective
LEE	(18) → 25%	2	+	- 3	Sleep under a sedative, agitate when awake	TD, HR, RR rises Diaphoresis SpO2 drops
YUR	(14) → 15%	2	+	+ 3	Unable to sleep, tired, despair, hallucination Agitate. Want to die. Disconnect the ventilator hose.	TD, HR, RR rises Diaphoresis SpO2 drops
HEP	(9) → 8%	2	-	0	Often awake suddenly	TD, HR, RR rises Diaphoresis SpO2 drops
SPJ	(13) → 15%	2	-	0	Often awake suddenly, hallucination in the first 2 days	TD, HR, RR rises Diaphoresis SpO2 drops
SNJ	(17) → 25%	2	+	+ 1	Unable to sleep well and has no appetite.	TD, HR, RR rises Diaphoresis SpO2 drops
PUR	(17) → 25%	2	+	0	Sleep under sedation, palpitation	TD, HR, RR rises Diaphoresis SpO2 drops
NMH	(14) → 15%	2	-	+2	Unable to sleep, no appetite, bad suspicion to the health staff. Agitate. Tired and give up. Suicide trial by trying to disconnect the ventilator hose.	TD, HR, RR rises Diaphoresis SpO2 drops
NRM	(20) → 40%	2	+	+ 3	Hallucination, unable to sleep, feeling tired, and wanting to die. Agitate. Trying to disconnect the ventilator hose.	TD, HR, RR rises Diaphoresis SpO2 drops
KOK	(18) → 25%	2	+	- 2	Can sleep but often awake randomly	TD, HR, RR rises Diaphoresis SpO2 drops

Tentamen suicidi is one of the main symptoms of neuropsychiatric syndromes that can be found in patients. In this case series, 3 of 9 patients with tentamen suicidi, were trying to disconnect the ventilator hose.

**TABLE 4:** Daily Monitoring and Management Checklist during RICU treatment related to Neuro-Psychiatric Syndrome.

Name	Daily checklist	Subjective	Objective	Neuro-Psychiatry Syndrome Characteristic	Comorbid
LEE	FAST HUG BIDS	Recurrent anxiety, back pain	Inadequate Feeding, Lesion in the back	Acute confusion, Delirium Hypoactive	Diabetes Hypertension
	CAM-ICU	Can sleep after being given the drug, when you wake up restless	+		
	RASS		- 3		
YUR	FAST HUG BIDS	Panic, and easily anxious	Inadequate Feeding	Delirium	Hypertension Asthma
	CAM-ICU	Can't sleep, want to go home, is tired, and give up, many shadows around him. Disconnect the ventilator hose. Want to die.	+		
	RASS		+ 3		
HEP	FAST HUG BIDS	Recurrent anxiety, inadequate feeding		Acute confusion	Diabetes
	CAM-ICU	Often wakes up suddenly during sleep, Nausea	-		
	RASS		0		

Name	Daily checklist	Subjective	Objective	Neuro-Psychiatry Syndrome Characteristic	Comorbid
SPJ	FAST HUG BIDS	High anxiety		Acute confusion, Delirium in the first 2 days	Obesities
	CAM-ICU	Often woke up suddenly during sleep, the first 2 days saw shadows	-		
	RASS		0		
SNJ	FAST HUG BIDS	Back pain		Acute confusion	Hypertension
	CAM-ICU	Cannot sleep well and have no appetite	+		
	RASS		+1		
PUR	FAST HUG BIDS			Acute confusion	Diabetes Hypertension
	CAM-ICU	Can sleep after being given medicine, pounding	+		
	RASS		0		
NMH	FAST HUG BIDS	Inadequate feeding, back, and butt pain		Acute psychotic, Encephalopathies	Diabetes Hypertension Obesities
	CAM-ICU	Can't sleep, no appetite, bad thoughts towards all the staff who come. Tired and give up, trying to disconnect the ventilator hose.	-		
	RASS		+2		
NRM	FAST HUG BIDS	Inadequate feeding,		Delirium, Encephalopathies	Obesities
	CAM-ICU	Seeing shadows, unable to sleep, feeling tired, and wanting to die. Trying to disconnect the ventilator hose.	+		
	RASS		+ 3		
KOK	FAST HUG BIDS	Eat well	High blood glucose (233-394)	Delirium hypoactive	Diabetes
	CAM-ICU	Sleep but sometimes wake up	+		
	RASS		-2		

The average total length of intensive care to discharge is 13 days (10-17 days). Symptoms and complications arise during treatment associated with the neuropsychiatric syndrome, especially starting from the rejection of non-invasive oxygen therapy, severe anxiety, depression, suicide trial (YUR, NMH, NRM), delirium to decreased consciousness resulting in mortality (Table 5).

**TABLE 5:** RICU Treatment Length, Oxygen Therapy Modality, Oxygen Therapy Complications related to Neuropsychiatric Syndrome.

Name	O2 NRBM Duration (days)	HFNC Duration (days)	NIV Duration (days)	Invasive MV Duration (days)	ICU Length of stay (days)	End of treatment outcome
LEE	4	4	1	5	14	Discharged with anxiety defect
YUR	6	2	1	4	14	Died
HEP	3	4	1	3	11	Discharged, no sequelae
SPJ	2	15	-	-	17	Discharged with anxiety defect
SNJ	2	10	1	-	13	Discharged, no sequelae
PUR	4	6	-	-	10	Discharged, no sequelae
NMH	3	3	1	3	10	Died
NRM	3	5	1	4	13	Died
KOK	2	13	-	-	15	Discharged, no sequelae

**DISCUSSION**

The SARS-CoV-2 virus causing COVID-19 spread rapidly and has become a global pandemic. In addition to respiratory manifestations, neuropsychiatric syndromes also become the main concern in COVID-19 patients. About 0.9% to 4% COVID-19 patients develop psychotic symptoms.<sup>13</sup> The mechanism of psychotic symptoms in COVID-19 patients is still not fully understood.

Here we present 9 cases of COVID-19-associated neuropsychiatric syndrome with respiratory failure and given oxygen therapy. In this case series, the main symptom of the neuropsychiatric syndrome was tentamen suicidi. Tentamen suicidi has been reported in several previous studies, so it raises concern over the increased suicidal risk during the COVID-19 pandemic.<sup>14,15,16</sup>

Pathogenesis of psychotic is related to cytokines, but it can also be a manifestation of ischemic events due to hypercoagulability and vascular endothelial dysfunction mediated by proinflammatory cytokines.<sup>17,18</sup> In our patients, severe COVID-19 with respiratory failure, there is the elevation of proinflammatory cytokine.

Length of Oxygen Therapy Modalities especially, Invasive Mechanical Ventilation, Complications of Oxygen Therapy associated to the incident of tentamen suicidi and complications that arise during treatment related to Neuro-psychiatric syndromes, especially starting from the rejection of non-invasive oxygen therapy, severe anxiety, depression, suicide trial, delirium to decreased consciousness resulting in mortality. There are 3 of 9 patients with suicide trial by disconnect the ventilator hose. Psychiatric manifestations in severe COVID-19 were triggered or exacerbated due to a combination of systemic inflammation, hypoxia resulting from respiratory failure, and neuro-inflammation. Tentamen suicidi was associated with the increase of IL-6 from >10 pG/ml to nG/ml (>10x N).<sup>19</sup> Several studies implicate complement activation and hypercoagulation before psychosis in the general population.<sup>20</sup>

There are 3 of 9 patients who died, the three patients received treatment using non-invasive mechanical ventilation for 1 day and continued treatment using invasive mechanical ventilation for 3-4 days due to the patient's condition worsening. The use of mechanical ventilation is useful for preventing the worsening of ARDS disease, besides the use of mechanical ventilation functions to prevent tissue hypoxia, desaturate, prevent cytokine storms and treat sleep disorders in COVID-19, delirium, and tend to suicide trials in patients. Patients with severe respiratory failure are aware that the importance of early intubation or early tracheostomy and adequate anxiolytic sedation to prevent worsening of the patient's condition to death.

## CONCLUSION

This case series can provide an overview for the clinician that the ability of an intensivist or intensive manager of Covid, it important to recognize and carry out clinical management of the symptoms of a neuropsychiatric syndrome especially testament suicide, that can occur in COVID-19 patients with acute respiratory failure who are being treated intensively at the RICU or those who are hospitalized. It also can reduce the risk of morbidity, mortality and significantly improve the outcome of treated patients. In some cases of patients who can go through this deteriorating condition, there is indeed a sequel to persistent anxiety, and this requires rehabilitative therapy both physically and psychologically by pulmonologists, medical rehabilitation, and most importantly the role of the intensivist to prevent the occurrence of worsening of neuropsychiatry syndrome during intensive care in the Intensive Care Unit.

## REFERENCES

- [1] Chen Y, Liu Q, Guo D. Emerging coronaviruses: genome structure, replication, and pathogenesis. *Journal of medical virology*. 2020 Apr;92(4):418-23. <https://doi.org/10.1002/jmv.25681>
- [2] Nile, S. H., Nile, A., Qiu, J., Li, L., Jia, X., & Kai, G. (2020). COVID-19: Pathogenesis, cytokine storm, and therapeutic potential of interferons. *Cytokine & growth factor reviews*, 53, 66-70. <https://doi.org/10.1016/j.cytogfr.2020.05.002>
- [3] Jain V dan Yuan JM. Predictive symptoms and comorbidities for severe COVID-19 and intensive care unit admission: a systematic review and meta-analysis, *International Journal of Public Health* (2020);65:533-546. <https://doi.org/10.1007/s00038-020-01390-7>
- [4] Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, Cereda D, Coluccello A, Foti G, Fumagalli R, Iotti G. Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy Region, Italy. *Jama*. 2020 Apr 28;323(16):1574-81. [doi:10.1001/jama.2020.5394](https://doi.org/10.1001/jama.2020.5394)
- [5] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*. 2020 Feb 15;395(10223):497-506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- [6] Yang X, Yu Y, Xu J, Shu H, Liu H, Wu Y, Zhang L, Yu Z, Fang M, Yu T, Wang Y. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *The Lancet Respiratory Medicine*. 2020 May 1;8(5):475-81. [https://doi.org/10.1016/S2213-2600\(20\)30079-5](https://doi.org/10.1016/S2213-2600(20)30079-5)
- [7] Wu C, Chen X, Cai Y, Zhou X, Xu S, Huang H, Zhang L, Zhou X, Du C, Zhang Y, Song J. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. *JAMA internal medicine*. 2020 Jul 1;180(7):934-43. [doi:10.1001/jamainternmed.2020.0994](https://doi.org/10.1001/jamainternmed.2020.0994)
- [8] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, Xiang J, Wang Y, Song B, Gu X, Guan L. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The lancet*. 2020 Mar 28;395(10229):1054-62. [https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)
- [9] Li X, Geng M, Peng Y, Meng L, Lu S. Molecular immune pathogenesis and diagnosis of COVID-19. *Journal of pharmaceutical analysis*. 2020 Apr 1;10(2):102-8. <https://doi.org/10.1016/j.jpha.2020.03.001>
- [10] Gunnell D, Appleby L, Arensman E, Hawton K, John A, Kapur N, Khan M, O'Connor RC, Pirkis J, Caine ED, Chan LF. Suicide risk and prevention during the COVID-19 pandemic. *The Lancet Psychiatry*. 2020 Jun 1;7(6):468-71. [https://doi.org/10.1016/S2215-0366\(20\)30171-1](https://doi.org/10.1016/S2215-0366(20)30171-1)
- [11] Borovina T, Mastelić T, Glavina G, Glavina T. COVID-19 Associated Psychotic Disorder with Suicidal Behaviour-Case Report. *Psychiatria Danubina*. 2021 Jan 1;33(3):421-4. <https://doi.org/10.24869/psyd.2021.421>
- [12] Sultana S, Ananthapur V. COVID-19 and its impact on neurological manifestations and mental health: the present scenario. *Neurological Sciences*. 2020 Nov;41(11):3015-20. <https://doi.org/10.1007/s10072-020-04695-w>
- [13] Dinakaran D, Manjunatha N, Kumar CN, Suresh BM. Neuropsychiatric aspects of COVID-19 pandemic: A selective review. *Asian Journal of Psychiatry*. 2020 Oct 1; 53:102188. <https://doi.org/10.1016/j.ajp.2020.102188>
- [14] Noone R, Cabassa JA, Gardner L, Schwartz B, Alpert JE, Gabbay V. New-onset psychosis and mania following COVID-19 infection. *Journal of psychiatric research*. 2020 Nov; 130:177. [doi: 10.1016/j.jpsychires.2020.07.042](https://doi.org/10.1016/j.jpsychires.2020.07.042)

- [15] Huarcaya-Victoria J, Meneses-Saco A, Luna-Cuadros MA. Psychotic symptoms in COVID-19 infection: A case series from Lima, Peru. *Psychiatry research*. 2020 Nov; 293:113378. doi: 10.1016/j.psychres.2020.113378
- [16] Gillett G, Jordan I. Severe psychiatric disturbance and attempted suicide in a patient with COVID-19 and no psychiatric history. *BMJ Case Reports CP*. 2020 Oct 1;13(10): e239191. doi.org/10.1136/bcr-2020-239191
- [17] Parra A, Juanes A, Losada CP, Álvarez-Sesmero S, Santana VD, Martí I, Urricelqui J, Rentero D. Psychotic symptoms in COVID-19 patients. A retrospective descriptive study. *Psychiatry research*. 2020 Sep 1; 291:113254. <https://doi.org/10.1016/j.psychres.2020.113254>
- [18] Gavriilaki E, Anyfanti P, Gavriilaki M, Lazaridis A, Douma S, Gkaliagkousi E. Endothelial dysfunction in COVID-19: lessons learned from coronaviruses. *Current hypertension reports*. 2020 Sep;22(9):1-2. <https://doi.org/10.1007/s11906-020-01078-6>
- [19] Steardo L, Verkhatsky A. Psychiatric face of COVID-19. *Translational psychiatry*. 2020 Jul 30;10(1):1-2. DOI: 10.1038/s41398-020-00949-5
- [20] Mongan D, Cannon M, Cotter DR. COVID-19, hypercoagulation and what it could mean for patients with psychotic disorders. *Brain, behavior, and immunity*. 2020 Aug; 88:9. 10.1016/j.bbi.2020.05.067