



The impact of COVID-19 on sleep and circadian rhythm

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The circadian rest-activity pattern is the biological rhythm of approximately 24 h, which corresponds to cyclical variations in behavior, physiology, and sleep-wake cycle, resulting from an intrinsic temporal control system. The stability of this biological rhythm reflects the optimal organic functionality and health; however, the desynchronization between the circadian system and the necessary hours of sleep can cause disturbances in this system and, consequently, sleep disorders. There are ways to assess the sleep-wake cycle, including the use of subjective and objective measures, such as sleep diaries and actigraphy. Moreover, nocturnal polysomnography is also used for objective assessment of sleep and various physiological parameters, being the best option for a complete evaluation of sleep parameters; despite this, polysomnography is used in the suspicion of sleep disorders.⁽¹⁾ Thus, the use of polysomnography has limitations for the assessment of those who have an impaired sleep-wake cycle.

Given the scenario that the entire world has found itself in since 2020, the relationship between SARS-CoV-2 infection and its negative impacts on sleep and circadian rhythm has been investigated. In the present issue of the *Jornal Brasileiro de Pneumologia*, Henríquez-Beltrán et al.⁽²⁾ used as a measurement strategy actigraphy and nocturnal home polysomnography, respectively, as a measurement strategy to assess the circadian cycle and sleep disorders in patients who had COVID-19 between April and July of 2020. Evaluations occurred four months after the acute phase of COVID-19.

It has been reported that, during the acute phase of the infection, regardless of the symptoms or the need for hospitalization, COVID-19 promotes detrimental changes in sleep,⁽³⁾ and that this scenario persists even six months after the acute phase, resulting in sequelae. In general, 63% of the patients experienced fatigue or muscle weakness, and 23% had sleep difficulties.⁽⁴⁾

Investigations on the influence of COVID-19 and the circadian rest-activity pattern are scarce, although the pandemic scenario has been related to the impairment of this pattern and elevated levels of symptoms of depression, anxiety, and stress during the lockdown period. Henríquez-Beltrán et al.⁽²⁾ reported that patients with moderately severe COVID-19 had a higher prevalence of difficulty of falling asleep, staying asleep, and waking up early, whereas patients with more severe disease experienced difficulty staying asleep and waking up early.

Such outcomes are important to elucidate the association between the severity of COVID-19 and the sleep-wake

cycle since the aforementioned variables reflect the behavior of the circadian cycle. In addition, a previous study observed that, three months after hospital discharge, 60.5% of the patients presented poor sleep quality (as determined by a subjective index and actigraphy), and sleep duration was < 7 h.⁽⁵⁾ In addition, the presence of sleep disorders, such as obstructive sleep apnea (OSA), results in negative outcomes in this population. ⁽⁶⁾ Henríquez-Beltrán et al.⁽²⁾ reported that the risk for OSA was higher in the moderate and severe COVID-19 groups. When evaluated by home polysomnography, the prevalences of OSA in the mild, moderate, and severe COVID-19 groups were, respectively, 27.8%, 64.7%, and 80.0%. The relationship between OSA and hospitalized COVID-19 patients has also been studied,⁽⁷⁾ showing that the prevalence of OSA in those patients was 15.3%. This divergence is mainly due to the difference in the time of OSA assessment and the number of patients evaluated: 60⁽²⁾ and 3,185.⁽⁷⁾

Henríquez-Beltrán et al.⁽²⁾ reported that sleep quality was impaired in the patients regardless of disease severity. Similarly, there was a higher prevalence of insomnia in the three severity groups studied. In addition, actigraphy showed that the groups had a sleep duration < 7 h but good sleep efficiency.

Another circadian rest-activity pattern parameter—fragmentation of the rest-activity rhythm, determined by intraday variability—was shown to be impaired in all groups studied, but it was significantly higher in the moderate COVID-19 group.⁽²⁾ Circadian disruption has been linked to an increased risk for diseases such as cardiovascular disease, diabetes, hypertension, obesity, insomnia, and cancer.⁽¹⁾ The outcome found in the study by Benítez et al.⁽⁵⁾ is in line with the aforementioned findings,⁽²⁾ and indicates that mental health should be taken into account as a marker linked to sleep deprivation after COVID-19.

Although Henríquez-Beltrán et al.⁽²⁾ investigated few patients, there are COVID-19 sequelae that affect sleep parameters and circadian rest-activity patterns that persist even after an extended period after the acute phase of the disease, promoting fragmentation of the circadian rhythm at rest and impairing parameters associated with sleep and mental health.

In conclusion, the central message of the study⁽²⁾ is clear: changes in sleep, circadian cycle pattern, and mental health appear to be common for at least four months after the acute phase of COVID-19, especially in patients who have developed more severe disease. However, these results should be viewed with caution.

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REFERENCES

1. Frange C, Coelho FM, editors. *Sleep Medicine and Physical Therapy: A Comprehensive Guide for Practitioners*: Cham, Switzerland: Springer Nature; 2022. <https://doi.org/10.1007/978-3-030-85074-6>
2. Henríquez-Beltrán M, Labarca G, Cigarroa I, Enos D, Lastra J, Nova-Lamperti E, et al. Sleep health and the circadian rest-activity pattern four months after COVID-19. *J Bras Pneumol*. 2022;48(3):e20210398. <https://doi.org/10.36416/1806-3756/e20210398>
3. Bhat S, Chokroverty S. Sleep disorders and COVID-19. *Sleep Med*. 2022;91:253-261. <https://doi.org/10.1016/j.sleep.2021.07.021>
4. Huang C, Huang L, Wang Y, Li X, Ren L, Gu X, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet*. 2021;397(10270):220-232. [https://doi.org/10.1016/S0140-6736\(20\)32656-8](https://doi.org/10.1016/S0140-6736(20)32656-8)
5. Benitez ID, Moncusi-Moix A, Vaca R, Gort-Paniello C, Minguez O, Santistevé S, et al. Sleep and Circadian Health of Critical COVID-19 Survivors 3 Months After Hospital Discharge. *Crit Care Med*. 2022;50(6):945-954. <https://doi.org/10.1097/CCM.0000000000005476>
6. Peker Y, Celik Y, Arbatli S, Isik SR, Balcan B, Karataş F, et al. Effect of High-Risk Obstructive Sleep Apnea on Clinical Outcomes in Adults with Coronavirus Disease 2019: A Multicenter, Prospective, Observational Clinical Trial. *Ann Am Thorac Soc*. 2021;18(9):1548-1559. <https://doi.org/10.1513/AnnalsATS.202011-1409OC>
7. Maas MB, Kim M, Malkani RG, Abbott SM, Zee PC. Obstructive Sleep Apnea and Risk of COVID-19 Infection, Hospitalization and Respiratory Failure. *Sleep Breath*. 2021;25(2):1155-1157. <https://doi.org/10.1007/s11325-020-02203-0>