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The COVID-19 Pandemic and its Influence on Sleep Quality: A Narrative Review of Prevalence, Correlates, and Implications

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Abstract

Introduction: The COVID-19 pandemic, has been a global stressor, disrupting daily routines and increasing psychological distress. A growing body of evidence indicates a rise in reports of sleep disorders among the population during this pandemic [1]. This narrative review synthesizes current literature to summarize the scale, risk factors, and health implications of pandemic-related sleep disturbances.

Aim of the study: This article aims to analyze the prevalence and clinical impact of sleep disturbances during the COVID-19 pandemic, with particular focus on risk groups, contributing psychosocial factors, and associations with mental health.

State of Knowledge: Meta-analyses confirm a high global prevalence of sleep problems during the pandemic, with pooled rates of sleep disturbances exceeding 30% in the general population [2]. These problems were significantly more pronounced in specific groups, including patient-facing healthcare workers [3], patients infected with Covid-19, and individuals with pre-existing psychiatric conditions [4]. Key contributing factors included pandemic-related stress, fragmentation of habitual daily patterns, and the onset of circadian system instability [5]. A

strong relationship has been established between sleep disturbances and worsened mental health, particularly anxiety and depression [6]. Furthermore, sleep problems have emerged as a persistent symptom of Post-Acute Sequelae of SARS-CoV-2 infection (PASC, or Long COVID) [7].

Conclusion: Sleep disturbances represent an important public health crisis precipitated by the COVID-19 pandemic, manifesting as "coronasomnia". This review concludes that systematically addressing sleep health is crucial for post-pandemic sleep disturbances recovery, necessitating targeted public health strategies that integrate standardized screening in vulnerable populations, promotion of sleep hygiene, and the implementation of evidence-based interventions like cognitive-behavioral therapy for insomnia.

Keywords: COVID-19; SARS-CoV-2; Pandemic; Sleep quality; Sleep Disorders; Mental health; Healthcare workers; Lockdown

INTRODUCTION

Sleep is a fundamental, non-negotiable pillar of human health, intricately linked to optimal cognitive function, emotional regulation, and metabolic homeostasis. Crucially, sleep and immune function share a bidirectional relationship; adequate sleep promotes effective innate and adaptive immune responses, while sleep deprivation is associated with increased susceptibility to infection and a heightened pro-inflammatory state [8]. The integrity of this sleep-immune axis is therefore essential for maintaining health and resilience, particularly in the face of a novel viral threat.

Even before the COVID-19 pandemic, sleep disorders represented a significant public health burden. Insomnia is a disorder characterized by persistent difficulty initiating or maintaining sleep. The global occurrence of insomnia symptoms is around 30 to 35 percent [9]. Poor sleep quality and its associated daytime impairments were widely recognized as comorbid factors in

a range of chronic conditions, one of many being cardiovascular disease, also sleep disturbances correlate with depression [10]. This established baseline underscores that sleep health was already a vulnerable target for a large-scale societal stressor.

The emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the ensuing COVID-19 pandemic constituted an unprecedented global crisis. Its impact was multifaceted, encompassing direct morbidity and mortality from the viral infection, overwhelmed healthcare systems, and profound psychosocial upheaval due to public health measures like lockdowns, social isolation, and economic instability. This created a perfect storm of chronic stress, and uncertainty, setting the stage for a widespread disruption of normal physiological and psychological processes, including sleep.

The pandemic impairs sleep through several interconnected pathways. Psychological stress, that might be caused by anxiety about health, financial worries, and grief, directly activates neurobiological systems (e.g., the hypothalamic-pituitary-adrenal axis) that interfere with sleep initiation and maintenance [11]. Pandemic-related healthcare challenges, including barriers to accessing sleep care and the diversion of medical resources, have complicated the management of both new and pre-existing sleep disorders [12].

This review employs operational definitions from established sources:

Sleep Quality—refers to an individual's self-satisfaction with all aspects of the sleep experience, characterized by four key attributes: sleep efficiency, sleep latency, wake after sleep onset and sleep duration [13].

Insomnia— ongoing challenges in starting sleep, sustaining its length, maintaining continuity, or achieving adequate restfulness—despite sufficient chances to sleep—resulting in daily dysfunction. [14].

Circadian Rhythm Dysregulation—denotes a persistent misalignment between the endogenous circadian pacemaker and exogenous zeitgebers, resulting in maladaptive sleep phase timing relative to socioprofessional obligations [15].

Pandemic-associated sleep pathology selectively burdens vulnerable subpopulations: sleep disruption rates among doctors treating COVID-19 cases reached 41.6 % [16]; individuals exhibiting critical COVID-19 illness, particularly requiring intensive care admission, demonstrated reduced sleep continuity and elevated sleep fragmentation relative to mild cases [17]; youth populations encountered interruptions in schooling, peer interactions, and daily schedules essential for proper sleep development [18]; geriatric population encounter augmented apprehension caused by solitude because of lock downs [19].

This narrative review systematically enumerates prevalence disparities across demographics, dissects psychosocial/lifestyle/clinical determinants via domain-specific analysis, and delineates pragmatic public health imperatives.

2. RESULTS & DISCUSSION

2.1 Overview of Pandemic Sleep Disturbances

Meta-analysis integration uncovers COVID-19 period sleep disruptions presenting as a widespread health emergency, where insomnia stands out as the primary predominant phenotype across heterogeneous cohorts. Literature syntheses confirm prevalence of sleep disturbances surpassing 40% in general populations during lockdown phases. Termed "coronasomnia," this occurrence embodies the intersection of emotional turmoil, circadian rhythm misalignment, and neuroinflammatory sequelae converging to erode sleep homeostasis at population scale [20] [21].

2.2 High-Risk Groups: Healthcare Workers and ICU Survivors

Frontline healthcare personnel constituted a paradigmatic high-risk cohort, confronting shift dyssynchrony compounded by stress and pathogen apprehension. Physicians managing COVID-19 cases exhibited sleep disruption rates reaching 41.6%, reflecting the toll of protracted vigilance demands and irregular rostering patterns [16][17].

Critical COVID-19 survivors who developed acute respiratory distress syndrome and required intensive care unit admission often exhibited compromised sleep quality alongside marked alterations in their circadian rest-activity rhythms persisting six months post-hospital discharge. Actigraphy assessments revealed substantial variability in these patterns, particularly pronounced fragmentation of the rest-activity rhythm among patients with extended hospitalization durations, prolonged intensive care stays, and histories of invasive mechanical ventilation. Such disruptions underscored the predictive role of baseline clinical exposures in fostering adverse long-term sleep and circadian outcomes within this vulnerable cohort [22].

2.3 Impacts on Youth and Elderly Populations

The COVID-19 pandemic profoundly disrupted sleep architecture across vulnerable populations, particularly youth and the elderly, as evidenced by systematic analyses of PubMed-indexed studies. In youth, encompassing children and adolescents, pandemic-induced lockdowns precipitated a pooled prevalence of sleep disturbances reaching 54%, alongside 49% failing to meet recommended sleep durations, often linked to delayed bedtimes, and heightened

screen exposure. These shifts manifested as poor sleep quality and irregular patterns, with adolescents exhibiting delayed bedtimes and elevated insomnia risks, during lockdown confinement [18][23].

Among elderly cohorts, sleep deterioration affected 29% since outbreak onset, with older age and male gender emerging as predictors of exacerbated complaints. Furthermore, individuals reporting frequent feelings of isolation or heightened loneliness since the pandemic's onset experienced greater sleep difficulties [24].

The COVID-19 pandemic compromised long-term sleep quality in older adults, with poor sleep reported by 52.9% of those previously infected and 43.8% of non-infected controls. Daily naps affected 70% of the COVID group and 62.1% of controls. During the second wave of the COVID-19 pandemic, insomnia and sleep apnea emerged as the predominant sleep disorders reported in older adults. Independent predictors of poor sleep quality encompassed female sex, memory complaints , insomnia, anxiety, depression, joint disease, glucose intolerance, psychoactive medications , diuretics, and polypharmacy [25].

2.4 Underlying Mechanisms and Pathogenesis

COVID-19 triggers sleep disorders establishing the "coronasomnia" phenomenon. "Coronasomnia" and "COVID-somnia" characterize diverse manifestations of impaired rest including sleeplessness, fragmented nighttime patterns, shifted diurnal rhythms, non-restorative sleep, and diminished overall restfulness. These disturbances stem from viral apprehension, socioeconomic pressures like joblessness and monetary worries, confinement-induced solitude, and physiological and emotional aftermaths of SARS-CoV-2 contraction [26]. Sleep disturbances elicit neuroinflammatory mechanisms that compromise blood-brain barrier (BBB) integrity. Sleep deprivation elevates proinflammatory mediators including IL-6, TNF-α, IL-1β, and IL-17A. Chronic sleep restriction, that induce neuroinflammation, further impairs paracellular permeability, creating a vicious cycle wherein sleep loss facilitates SARS-CoV-2 entry into the brain. Clinical evidence confirms that sleep disturbances increase blood-brain barrier (BBB) permeability in humans. In healthy young man, acute sleep deprivation elevates serum levels of the neuron-specific enolase and S-100B.Obstructive sleep apnea constitutes a risk element inciting neuroinflammation alongside oxidative-nitrosative stress. Chronic sleep restriction subsequently diminishes nitric oxide bioavailability while increasing endothelin levels, and promotes amyloid-β deposition and cerebral amyloid angiopathy, collectively driving BBB disruption. Sleep EEG patterns can serve as non-invasive biomarkers of BBB leakage [27].

2.5 Risk Factors and Correlates

Risk factors for stress prominently include female gender, younger age groups (under 40 years), and pre-existing psychiatric conditions, alongside unemployment, lower educational attainment, and frequent exposure to pandemic-related media. Anxiety and depression are associated with sleep disorders. Among healthcare workers, frontline exposure, extended working hours, and close patient contact amplify vulnerability towards sleep disturbances. Also those patients with prior mental health histories are at higher risk of sleep dysfunction. During initial lockdown stages, there was an elevated prevalence of difficulties with sleep onset or sustaining sleep throughout the night (23.9%), linked to advanced age, female gender, income decline, caregiving for older relatives, alcohol consumption, depressive symptoms, anxiety, and tension. Protective elements included engaging in activities like artistic creation or listening to music. Pandemic-specific correlates encompass lockdown-induced social isolation and financial distress in infected cohorts. Poor sleep quality itself heightens SARS-CoV-2 acquisition risk and disease severity through immune dysregulation [28][29].

2.6 Recommended Therapeutic Approaches

The management of sleep disturbances in the context of COVID-19 and long COVID necessitates an integrated, patient-centered strategy. Given the complex, multifactorial nature of sleep disturbances in long COVID, non-pharmacological interventions show particular promise for management. Good sleep hygiene, physical activity and relaxation therapies exhibit substantial potential for managing long COVID consequences. Cognitive Behavioral Therapy for Insomnia (CBT-I) is a leading example of such an intervention that can address the insomnia commonly experienced as a consequence of both post-viral illness and pandemic-related psychosocial stress. The assessment is typically guided by validated instruments, such as the Insomnia Severity Index (ISI), to tailor interventions [30][31].

3. CONCLUSIONS

The COVID-19 pandemic unleashed a pervasive secondary crisis of sleep disturbances, termed "coronasomnia," with meta-analyses revealing pooled insomnia symptoms prevalence surpassing 40% during lockdowns—rates escalating to 41.6% among frontline healthcare workers and 54% in youth. Vulnerable cohorts, including COVID-19 patients, ICU survivors, women, the elderly, and those with pre-existing psychiatric conditions, faced amplified risks from psychosocial stressors, circadian misalignment, reduced light exposure, and

neuroinflammatory sequelae like elevated IL-6 and TNF-α compromising blood-brain barrier integrity. These disruptions fueled bidirectional ties to anxiety and Long COVID persistence. Standardized screening in high-risk groups is essential, alongside public health initiatives promoting sleep hygiene and appropriate therapies for insomnia (CBT-I) to fortify recovery strategies and restore sleep-immune homeostasis.

AUTHOR CONTRIBUTIONS

Conceptualization: Agnieszka Radziwonka. Methodology: Agnieszka Radziwonka, Bartłomiej Maciej Wrochna, Anna Olborska. Investigation: Agnieszka Radziwonka, Anna Izabela Garbacz, Ada Niezgoda. Data curation: Tomasz J. Majszyk, Jacek Głuski, Paweł Kosiorek. Writing-Original Draft: Agnieszka Brzozowska, Agnieszka Radziwonka. Writing– Review & Editing: Patrycja Anna Borowiecka, Gabriela Stondzik, Aleksandra Karolina Węglarz. Supervision: Agnieszka Radziwonka. All authors have read and agreed with the published version of the manuscript.

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ETHICAL APPROVAL

The study was conducted in accordance with the Declaration of Helsinki. Ethical review and approval were waived because the data analyzed were retrospective and anonymized.

DISCLOSURE

The authors declare no conflict of interest.

DECLARATION OF THE USE OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

While preparing this manuscript, the authors used the Perplexity tool to enhance language quality and readability. After using this tool, the authors thoroughly reviewed and edited the text as necessary and accept full responsibility for the scientific content of the publication.

REFERENCES

1. Salehinejad, M. A., Azarkolah, A., Ghanavati, E., & Nitsche, M. A. (2022). Circadian disturbances, sleep difficulties and the COVID-19 pandemic. Sleep medicine, 91, 246–252. https://doi.org/10.1016/j.sleep.2021.07.011

2. Jahrami, H., BaHammam, A. S., Bragazzi, N. L., Saif, Z., Faris, M., & Vitiello, M. V. (2021). Sleep problems during the COVID-19 pandemic by population: a systematic review and meta-analysis. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine, 17(2), 299–313. https://doi.org/10.5664/jcsm.8930

3. Oteir, A. O., Nazzal, M. S., Jaber, A. F., Alwidyan, M. T., & Raffee, L. A. (2022). Depression, anxiety and insomnia among frontline healthcare workers amid the coronavirus pandemic (COVID-19) in Jordan: a cross-sectional study. BMJ open, 12(1), e050078. https://doi.org/10.1136/bmjopen-2021-050078

4. Liu, C. H., Stevens, C., Conrad, R. C., & Hahm, H. C. (2020). Evidence for elevated psychiatric distress, poor sleep, and quality of life concerns during the COVID-19 pandemic among U.S. young adults with suspected and reported psychiatric diagnoses. Psychiatry research, 292, 113345. https://doi.org/10.1016/j.psychres.2020.113345

5. Chen, S., & Cheng, C. (2024). Unveiling Coronasomnia: Pandemic Stress and Sleep Problems During the COVID-19 Outbreak. Nature and science of sleep, 16, 543–553. https://doi.org/10.2147/NSS.S459945

6. Viselli, L., Salfi, F., D'Atri, A., Amicucci, G., & Ferrara, M. (2021). Sleep Quality, Insomnia Symptoms, and Depressive Symptomatology among Italian University Students before and during the Covid-19 Lockdown. International journal of environmental research and public health, 18(24), 13346. https://doi.org/10.3390/ijerph182413346

7. Griffin D. O. (2024). Postacute Sequelae of COVID (PASC or Long COVID): An Evidenced-Based Approach. Open forum infectious diseases, 11(9), ofae462. https://doi.org/10.1093/ofid/ofae462[11]

8. Besedovsky, L., Lange, T., & Haack, M. (2019). The Sleep-Immune Crosstalk in Health and Disease. *Physiological reviews*, *99*(3), 1325–1380. https://doi.org/10.1152/physrev.00010.2018

9. Morin, C. M., Drake, C. L., Harvey, A. G., Krystal, A. D., Manber, R., Riemann, D., & Spiegelhalder, K. (2015). Insomnia disorder. Nature reviews. Disease primers, 1, 15026. https://doi.org/10.1038/nrdp.2015.26

10. Grandner, M. A., Jackson, N. J., Pak, V. M., & Gehrman, P. R. (2012). Sleep disturbance is associated with cardiovascular and metabolic disorders. Journal of sleep research, 21(4), 427–433. https://doi.org/10.1111/j.1365-2869.2011.00990.x

11. Han, K. S., Kim, L., & Shim, I. (2012). Stress and sleep disorder. Experimental neurobiology, 21(4), 141–150. https://doi.org/10.5607/en.2012.21.4.141

12. Kumar, N., & Gupta, R. (2022). Disrupted Sleep During a Pandemic. Sleep medicine clinics, 17(1), 41–52. https://doi.org/10.1016/j.jsmc.2021.10.006

13. Nelson, K. L., Davis, J. E., & Corbett, C. F. (2022). Sleep quality: An evolutionary concept analysis. Nursing forum, 57(1), 144–151. https://doi.org/10.1111/nuf.12659

14. Riemann, D., Benz, F., Dressle, R. J., Espie, C. A., Johann, A. F., Blanken, T. F., Leerssen, J., Wassing, R., Henry, A. L., Kyle, S. D., Spiegelhalder, K., & Van Someren, E. J. W. (2022). Insomnia disorder: State of the science and challenges for the future. Journal of sleep research, 31(4), e13604. https://doi.org/10.1111/jsr.13604

15. Vasey, C., McBride, J., & Penta, K. (2021). Circadian Rhythm Dysregulation and Restoration: The Role of Melatonin. Nutrients, 13(10), 3480. https://doi.org/10.3390/nu13103480

16. Salari, N., Khazaie, H., Hosseinian-Far, A., Ghasemi, H., Mohammadi, M., Shohaimi, S., Daneshkhah, A., Khaledi-Paveh, B., & Hosseinian-Far, M. (2020). The prevalence of sleep disturbances among physicians and nurses facing the COVID-19 patients: a systematic review

and meta-analysis. Globalization and health, 16(1), 92. https://doi.org/10.1186/s12992-020-00620-0

17. Tedjasukmana, R., Budikayanti, A., Islamiyah, W. R., Witjaksono, A. M. A. L., & Hakim, M. (2023). Sleep disturbance in post COVID-19 conditions: Prevalence and quality of life. Frontiers in neurology, 13, 1095606. https://doi.org/10.3389/fneur.2022.1095606

18. Richter, S. A., Ferraz-Rodrigues, C., Schilling, L. B., Camargo, N. F., & Nunes, M. L. (2023). Effects of the COVID-19 pandemic on sleep quality in children and adolescents: A systematic review and meta-analysis. Journal of sleep research, 32(1), e13720. https://doi.org/10.1111/jsr.13720

19. Parveen, S., George, S. M., & Chand, S. (2021). Was Sleep a Problem for the Elderly During COVID-19?. Sleep and vigilance, 5(2), 197–203. https://doi.org/10.1007/s41782-021-00164-2

20. Jao, P. P., Feng, H. P., & Tzeng, W. C. (2023). Hu li za zhi The journal of nursing, 70(5), 84–90. https://doi.org/10.6224/JN.202310_70(5).11

21. Jahrami, H. A., Alhaj, O. A., Humood, A. M., Alenezi, A. F., Fekih-Romdhane, F., AlRasheed, M. M., Saif, Z. Q., Bragazzi, N. L., Pandi-Perumal, S. R., BaHammam, A. S., & Vitiello, M. V. (2022). Sleep disturbances during the COVID-19 pandemic: A systematic review, meta-analysis, and meta-regression. Sleep medicine reviews, 62, 101591. https://doi.org/10.1016/j.smrv.2022.101591

22. Targa, A., Benítez, I., Moncusí-Moix, A., Vaca, R., Gort-Paniello, C., Minguez, O., Santisteve, S., Carmona, P., Torres, G., Labarca, G., Caballero, J., Barberà, C., Torres, A., González, J., De Gonzalo-Calvo, D., & Barbé, F. (2022). Sleep and circadian rest-activity pattern of critical COVID-19 survivors in the long-term: a 6-month follow-up study. *Sleep Medicine, 100*, S89–S90. https://doi.org/10.1016/j.sleep.2022.05.250

23. Sharma, M., Aggarwal, S., Madaan, P., Saini, L., & Bhutani, M. (2021). Impact of COVID-19 pandemic on sleep in children and adolescents: a systematic review and meta-analysis. Sleep medicine, 84, 259–267. https://doi.org/10.1016/j.sleep.2021.06.002

24. Cordeiro, C. R., Pestana, P. C., Côrte-Real, B., & Novais, F. (2022). Long Time, No Sleep: Sleep in Older Adults During the COVID-19 Pandemic. The primary care companion for CNS disorders, 24(3), 21m03224. https://doi.org/10.4088/PCC.21m03224

25. Peixoto, V. G. M. N. P., Facci, L. A., Barbalho, T. C. S., Souza, R. N., Duarte, A. M., & Almondes, K. M. (2024). The context of COVID-19 affected the long-term sleep quality of older adults more than SARS-CoV-2 infection. Frontiers in psychiatry, 15, 1305945. https://doi.org/10.3389/fpsyt.2024.1305945

26. Bhat, S., & Chokroverty, S. (2022). Sleep disorders and COVID-19. Sleep medicine, 91, 253–261. https://doi.org/10.1016/j.sleep.2021.07.021

27. Semyachkina-Glushkovskaya, O., Mamedova, A., Vinnik, V., Klimova, M., Saranceva, E., Ageev, V., Yu, T., Zhu, D., Penzel, T., & Kurths, J. (2021). Brain Mechanisms of COVID-19-Sleep Disorders. International journal of molecular sciences, 22(13), 6917. https://doi.org/10.3390/ijms22136917

28. Pataka, A., Kotoulas, S., Sakka, E., Katsaounou, P., & Pappa, S. (2021). Sleep Dysfunction in COVID-19 Patients: Prevalence, Risk Factors, Mechanisms, and Management. Journal of personalized medicine, 11(11), 1203. https://doi.org/10.3390/jpm11111203

29. Bhat, S., & Chokroverty, S. (2022). Sleep disorders and COVID-19. Sleep medicine, 91, 253–261. https://doi.org/10.1016/j.sleep.2021.07.021

30. Goh, D. Y., Lam, W. C., & Zhong, L. L. D. (2025). Effect of interventions for the management of sleep disturbances in patients with long COVID: a systematic review and meta-analysis of randomized controlled trials. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine, 21(11), 1993–2005. https://doi.org/10.5664/jcsm.11782

31. Shaik, L., Boike, S., Ramar, K., Subramanian, S., & Surani, S. (2023). COVID-19 and Sleep Disturbances: A Literature Review of Clinical Evidence. Medicina (Kaunas, Lithuania), 59(5), 818. https://doi.org/10.3390/medicina59050818