

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Brain, Behavior, & Immunity - Health

journal homepage: www.editorialmanager.com/bbih/default.aspx

How does the COVID-19 fuel insomnia?

Ali Cheshmehzangi^{a,b,*}, Hengcai Chen^b, Zhaohui Su^c, Tong Zou^b, Yu-Tao Xiang^d,
Ayotunde Dawodu^b^a Network for Education and Research on Peace and Sustainability (NERPS), Hiroshima University, Hiroshima, 739-8530, Japan^b Faculty of Science and Engineering, University of Nottingham Ningbo China, 315100, Ningbo, Zhejiang, China^c Center on Smart and Connected Health Technologies, Mays Cancer Center, School of Nursing, UT Health San Antonio, San Antonio, TX, 78229, USA^d Unit of Psychiatry, Department of Public Health and Medicinal Administration, Institute of Translational Medicine, Faculty of Health Sciences, Centre for Cognitive and Brain Sciences, Institute of Advanced Studies in Humanities and Social Sciences, University of Macau, Macao SAR, China

ARTICLE INFO

Keywords:

COVID-19
Insomnia
Coronasomnia
Covidsomnia
Sleeplessness
Pandemic

ABSTRACT

One of the leading health consequences of the pandemic is the prevalence of sleep-related issues, such as insomnia. Hence, this study highlights the relationship between COVID-19 and insomnia and how insomnia is increasing due to the pandemic. The study's findings summarise that the COVID-19 pandemic has produced ubiquitous mental challenges, including loneliness, anxiety, fear, stress, extreme tiredness, and health concerns. It is also associated with physical issues such as social isolation, juggling work or study, parenting challenges, and significant behavior changes stemming from mass home confinement. There are also economic hardships, financial insecurity, risk, and infection. These factors lead to undoing routines and broken circadian rhythms amid the pandemic, affecting three sleep regulatory processes of the homeostatic sleep drive, the circadian rhythm, and the arousal system.

Furthermore, we suggest future research directions to explore (1) long-term health impacts of the pandemic, (2) therapeutic strategies and the implementation of social policies to support people with sleep difficulties, (3) prevention programs and clinical interventions, and (4) nationwide or cross-regional online and practical psychological and sleep management intervention systems and platforms to address the psychological strain of isolation and traumatic experiences of the pandemic.

The adverse effects of the COVID-19 pandemic have led to a global surge of mental health issues. According to psychological, psychiatry, epidemiology, and social research, these issues occur under various circumstances. These circumstances could differ depending on whether the individuals contracted the disease personally or not. Hence, much of the impacts are related to individual experiences (Cheshmehzangi et al., 2022). There is an increase in sleeping-related issues, specifically insomnia. Associated terms, like 'COVID-somnia', 'Coronasomnia' or 'Covidsomnia', have been reported worldwide by tracking mental health responses to the novel coronavirus. Some surveys and data highlight that insomnia prevalence in the samples affected by the COVID-19 pandemic (Fig. 1) was estimated at 36.7% globally, 24.7% in the U.K., 37.6% in Greece, 33.2% in the USA, 19.1% in France, and 18.9% in China (Morin et al., 2021; Falkingham et al., 2020; Voitsidis et al., 2020; Mandelkorn et al., 2021; Kokou-Kpolou et al., 2020; Wang et al., 2021). One study showed that the number of Google searches for "insomnia" in the U.S. in 2020 increased rapidly compared with the previous three years (Zitting

et al., 2021). In addition, some COVID-19 survivors or patients with chronic diseases have long-term symptoms of sleeplessness (Choudhry et al., 2021). Also, a systematic review by Pappa et al. (2020) shows that 38.9% of healthcare workers suffered from insomnia during COVID-19. Another study also revealed that a third of medical staff in China suffered from insomnia (Zhang et al., 2020). Furthermore, women, younger groups, urban residents, and people with insecure livelihoods are identified to be more vulnerable to Coronasomnia (Voitsidis et al., 2020; Wang et al., 2021; Mandelkorn et al., 2021).

Coronasomnia, a sleeplessness condition triggered by a collision of stressors, was considered due to severe and long-term concerns induced by the pandemic. In 2020, the British Sleep Society (BSS) reported the negative impact of the COVID-19 on UK Sleep Services (BSS, 2020). COVID-19-related worry, loneliness, and more severe depressive symptoms are all predictive of insomnia (Voitsidis et al., 2020). The pandemic has brought unprecedented changes to society, work, and human activity, and the effects of the lockdown on social and biological rhythms

* Corresponding author. Network for Education and Research on Peace and Sustainability (NERPS), Hiroshima University, Hiroshima, 739-8530, Japan.
E-mail address: Ali.Cheshmehzangi@nottingham.edu.cn (A. Cheshmehzangi).

<https://doi.org/10.1016/j.bbih.2022.100426>

Received 7 February 2022; Accepted 7 February 2022

Available online 8 February 2022

2666-3546/© 2022 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

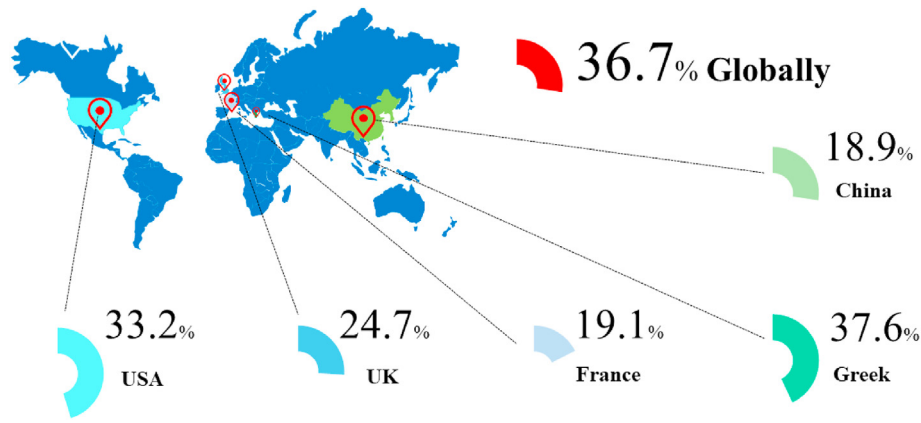


Fig. 1. Global estimated prevalence of 'COVID-Somnia'.



Fig. 2. Potential people with insomnia due to COVID-19.

cannot be neglected. In existing scholarly research, COVID-related insomnia is recognized as a mental health issue associated with significant psychological burden among different groups, except for the general public. For example, these groups include patients with COVID-19 or other diseases, medical or healthcare professionals combating the COVID-19, caretakers of special groups, and those in lockdown (Fig. 2).

So far, it is noted that several reasons cause the increased rate of insomnia, such as the physical symptoms or mental health symptoms due to the pandemic or lockdown and changes to the living/working/social environment (Fig. 3). In a word, the COVID-19 pandemic has produced ubiquitous mental challenges, including loneliness, anxiety, fear, stress, extreme tiredness, and health concerns. It is also associated with physical

issues such as social isolation, juggling work or study (including working remotely and home-schooling), parenting challenges, and significant behavior changes stemming from mass home confinement. There are also economic hardships, financial insecurity, risk, and infection (Falkingham et al., 2020; Kokou-Kpolou et al., 2020). These factors lead to undoing routines and broken circadian rhythms amid the pandemic, affecting each of the three sleep regulatory processes: the homeostatic sleep drive, the circadian rhythm, and the arousal system.

In addition to validating the effect of COVID-19 on insomnia, a significant number of studies have used different sampling methods, measurements, and criteria for insomnia. Thus, there is much uncertainty in making comparisons between studies (Morin et al., 2021). Most of the



Fig. 3. Factors associated with 'COVID-Somnia'.

current research on this topic was conducted by utilizing questionnaires, particularly online surveys or internet-based collection, to obtain data during the first pandemic wave. Regarding those respondent samples, groups are divided according to regions, gender, age, occupation, and health conditions. But there are no specific surveys or studies that consider specific populations. Hence, supplement studies would need to classify different populations who will be mitigated in the post-pandemic era and the long-term consequences of social isolation. The prevalence rates of insomnia may be affected by sampling bias and respondent memory and cannot be accurately compared with data derived from randomized samples or clinical reports. In addition, viral transmission and confinement vary widely across countries or regions. Thus, limited studies consider these factors or various potential contributors to 'COVID-Somnia'.

We can make some conclusions after a thorough review of the published literature. Firstly, the COVID-19 pandemic may continue to have long-term health impacts, so-called 'long COVID', and be a source of poor sleep quality and quantity. Secondly, future scientific studies may focus on therapeutic strategies and the implementation of social policies to support people with sleep difficulties. Thirdly, strategies to mitigate the adverse effects of the pandemic on sleep quality should include prevention programs and clinical interventions. Lastly, it is essential to have nationwide or cross-regional online and practical psychological and sleep management intervention systems and platforms to address the psychological strain of isolation and traumatic experiences of the pandemic.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

Data are available upon reasonable request.

Funding

MEXT and NSFC.

Authors' contributions

AC conceived the work and reviewed the literature. TZ drafted, and

edited the manuscript. ZS reviewed the literature and edited the manuscript. All authors approved the manuscript for submission.

Declaration of interest statement

The authors declare that they have no known conflict of interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

We would like to thank the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) for the provision of funding, and the National Natural Science Foundation of China for project number 71950410760.

References

- British Sleep Society (BSS), 2020. British sleep society: impact of covid-19 on UK sleep Services. From. <https://www.sleepsociety.org.uk/wp-content/uploads/2020/10/BSS-RC-Service-Review-01-10-2020-002.pdf>.
- Cheshmehzangi, A., Zou, T., Su, Z., 2022. The digital divide impacts on mental health during the COVID-19 pandemic. *Brain Behav. Immun.* 101, 211–213.
- Choudhry, A.A., Shahzeen, F.N.U., Choudhry, S.A., Batool, N., Murtaza, F., Dilip, A., et al., 2021. Impact of COVID-19 infection on quality of sleep. *Cureus* 13 (9).
- Falkingham, J., Evandrou, M., Qin, M., Vlachantoni, A., 2020. 'Sleepless in lockdown': unpacking differences in sleep loss during the coronavirus pandemic in the UK. From. <https://www.medrxiv.org/content/medrxiv/early/2020/07/21/2020.07.19.20157255.full.pdf>.
- Kokou-Kpolou, C.K., Megalaki, O., Laimou, D., Kousouri, M., 2020. Insomnia during COVID-19 pandemic and lockdown: prevalence, severity, and associated risk factors in French population. *Psychiatr. Res.* 290, 113128.
- Mandelkorn, U., Genzer, S., Choshen-Hillel, S., Reiter, J., Meira e Cruz, M., Hochner, H., et al., 2021. Escalation of sleep disturbances amid the COVID-19 pandemic: a cross-sectional international study. *J. Clin. Sleep Med.* 17 (1), 45–53.
- Morin, C.M., Bjorvatn, B., Chung, F., Holzinger, B., Partinen, M., Penzel, T., et al., 2021. Insomnia, anxiety, and depression during the COVID-19 pandemic: an international collaborative study. *Sleep Med.* 87, 38–45.
- Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V.G., Papoutsis, E., Katsaounou, P., 2020. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav. Immun.* 88, 901–907.
- Voitsidis, P., Gliatas, I., Bairachtari, V., Papadopoulou, K., Papageorgiou, G., Parlapani, E., et al., 2020. Insomnia during the COVID-19 pandemic in a Greek population. *Psychiatr. Res.* 289, 113076.
- Wang, J., Zhou, Y., Qian, W., Zhou, Y., Han, R., Liu, Z., 2021. Maternal insomnia during the COVID-19 pandemic: associations with depression and anxiety. *Soc. Psychiatr. Psychiatr. Epidemiol.* 1–9.
- Zhang, C., Yang, L., Liu, S., Ma, S., Wang, Y., Cai, Z., et al., 2020. Survey of insomnia and related social psychological factors among medical staff involved in the 2019 novel coronavirus disease outbreak. *Front. Psychiatr.* 11, 306.