



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Letter to the Editor

Insomnia during the COVID-19 pandemic in a Greek population



ARTICLE INFO

Keywords:

Sleep
Uncertainty
Loneliness
Worry

ABSTRACT

Insomnia is a major health issue associated with great psychological burden. Research of insomnia during a pandemic crisis is limited. The aim of the present study was to explore sleep difficulties during the COVID-19 pandemic in a Greek population. The three-day online survey included questions about sociodemographic characteristics, contact with COVID-19 and COVID-19-related negative attitudes, as well as the Athens Insomnia Scale (AIS), the Intolerance to Uncertainty scale (IUS), the De Jong Gierveld Loneliness scale (JGLS) and the Patient Health Questionnaire-2 (PHQ-2) Depression Scale. Altogether, 2,427 individuals participated in the study (with 2,363 of them providing all basic demographic data). Sleep problems were detected in 37.6% of the participants. Women and people in urban areas were more vulnerable to sleep problems, while younger age showed a non-significant trend. Those uncertain about having themselves, or someone close to them contracted the virus, also demonstrated elevated insomnia scores. Lastly, according to the regression analysis, higher levels of intolerance to uncertainty, COVID-19-related worry, loneliness, as well as more severe depressive symptoms, were all predictive of insomnia. Results may be used for the development of therapeutic strategies and implementation of social policies to support people with sleep difficulties.

Dear editor,

Since December 2019, the whole world experiences a novel situation due to the outbreak of SARS-CoV-2, leading to the COVID-19 pandemic. Fear of contamination and radical changes to everyday life are expected to impose stress on individuals, seriously affecting mental health, including sleep hygiene.

Aiming to examine the impact of the COVID-19 pandemic on sleep health in a Greek population, we conducted a web-based study during April 2020, three weeks after a national lockdown had been imposed in Greece (April 10–April 13). Of the 2,427 participants, a total of 2,363 subjects, provided all basic demographic data needed [1,800 females (76.2%); 563 males (23.8%); 55% within the age range 18–30 years; the majority (76.5%) were urban citizens]. The participants completed the following questionnaires: Athens Insomnia Scale (AIS) (Soldatos et al., 2003), Intolerance to Uncertainty Scale (IUS-12) (Carleton et al., 2007), De Jong Gierveld Loneliness Scale (JGLS) (Gierveld and Van Tilburg, 2006), Brief Patient Health Questionnaire 2 (PHQ-2) (Kroenke et al., 2003). Additionally, they responded to questions assessing COVID-19-related negative attitudes (worry, unpredictability, lethality) and others exploring if they, or someone close to them, had contracted the virus.

In this study, 37.6% of the participants scored above the cut-off score for insomnia. This percentage is greater than the worldwide insomnia prevalence, estimated before the pandemic between 3.9% and 22% (Kay-Stacey and Attarian, 2016) indicating an exacerbation of sleep disturbances. With regard to sociodemographic factors, the women's insomnia score (MAIS = 13.31, SD = 4.35) was significantly higher than men's (MAIS = 11.78, SD = 3.75) [$t(2358) = -751$, $p = 0.001$]. Urban citizens also scored higher (MAIS = 13.11, SD = 4.26) than rural residents (MAIS = 12.15, SD = 3.93) [$F(2,2397) = 6.866$, $p < 0.001$]. A non-significant trend for greater sleep difficulties in younger ages (18–30) was also noted.

Interestingly, those responding “I don't know” when asked if they had contracted the virus, scored significantly higher (MAIS = 13.75, SD = 4.55) [$F(2,2374) = 12.23$, $p < 0.001$] in AIS than those answering “yes” (MAIS = 11.83, SD = 1.83) or “no” (MAIS = 12.73, SD = 4.16). The same pattern was held when asked if someone close to them had contracted the virus. Those replying “I don't know” showed higher scores (MAIS = 13.92, SD = 4.67) [$F(2,2413) = 11.65$, $p < 0.001$] than those responding “yes” (MAIS = 13.16, SD = 4.83) or “no” (MAIS = 12.76, SD = 4.15).

A multiple linear regression was conducted to predict insomnia (AIS) based on the significance of the positive correlation of the independent variables. A significant equation was found [$F(4,2030) = 331,928$, $p < 0.001$] with an R^2 of 0.395. Participants' predicted insomnia was equal to $3.232 + 0.398$ (JGLS) + 1.338 (PHQ-2) + 0.63 (IUS) + 0.178 (COVID-19 worry).

This study revealed several interesting aspects related with sleep health. Insomnia seems to be affecting more people during the COVID-19 pandemic. Stress levels rise during a virus outbreak due to worry about health, financial consequences, changes in social life and the daily routine. Reduced physical fatigue and exposure to the sun, as well as increased use of electronic devices may also affect sleep homeostasis. Women seem to be more vulnerable, a finding compatible with the evidence suggesting that they are more prone to stress-related disorders such as post-traumatic stress disorder and anxiety disorders (Li and Graham, 2017). Rural residence may act protectively, providing more opportunities for physical activity and exposure to natural environments, as well as less strict application of restrictive measures. As suggested by the regression analysis, intolerance to uncertainty was associated with insomnia. Living in the pandemic, unaware of multiple aspects of this novel situation (e.g. virus transmission rate, morbidity) imposes stress on individuals struggling to deal with uncertainty. Ruminating thoughts provoking cognitive arousal and unpleasant physical reactions also hinder sleep promotion. This is in line with previous

<https://doi.org/10.1016/j.psychres.2020.113076>

Received 28 April 2020; Received in revised form 4 May 2020; Accepted 8 May 2020

Available online 12 May 2020

0165-1781/ © 2020 Elsevier B.V. All rights reserved.

findings (Lauriola et al., 2019) and may also explain the high AIS scores in those answering “I don’t know” when asked if they, or someone else close to them, had contracted the virus, since this answer suggests uncertainty. In this study, COVID-19 worry was also associated with insomnia. Worry provokes cognitive arousal and may therefore disturb sleep through this mechanism. Loneliness also showed a positive correlation with insomnia. There is evidence of a bidirectional relation between loneliness and insomnia. Loneliness may induce increased feelings of vulnerability, hence arousal, disturbing sleep. Conversely, poor sleep increases frustration related with feelings of isolation and may disturb contact with others e.g. due to abnormal sleep-wake schedule. Dysregulation of the hypothalamic-pituitary-adrenal axis may also be involved (Griffin et al., 2019). Finally, this study demonstrated an association between sleep and depression. This a well-established observation, since insomnia is considered an important precedent to depression, as well as a predictor of a depressive episode's relapse. Monoamines, inflammation, genetic factors and dysregulation of the circadian rhythm may be implicated in the pathophysiology (Fang et al., 2019).

In conclusion, insomnia constitutes a major health issue. Up to date, research of insomnia during a pandemic crisis is limited. To the best of our knowledge, this was the first study to explore sleep difficulties during the COVID-19 pandemic in a Greek population. This study revealed a high frequency of insomnia during the COVID-19 pandemic. Women and people living in urban areas were more susceptible to sleep difficulties. Unawareness of potential contact with COVID-19, intolerance to uncertainty, COVID-19-related worry, loneliness and depressive symptoms were significantly associated with insomnia. These findings may contribute to the management of insomnia during the COVID-19 pandemic. Provision of simple and clear information about the outbreak to combat uncertainty and worry, enhancement of social contact with the aid of technology, as well as the providence for screening and treatment of depression and anxiety may improve sleep difficulties.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

Acknowledgements

The authors would like to acknowledge the people that voluntarily took part in this study.

References

- Carleton, R.N., Norton, M.A.P.J., Asmundson, G.J.G., 2007. Fearing the unknown: a short version of the Intolerance of Uncertainty Scale. *J. Anxiety Disord.* 21, 105–117. <https://doi.org/10.1016/j.janxdis.2006.03.014>.
- Fang, H., Tu, S., Sheng, J., Shao, A., 2019. Depression in sleep disturbance: a review on a bidirectional relationship, mechanisms and treatment. *J. Cell. Mol. Med.* 23, 2324–2332. <https://doi.org/10.1111/jcmm.14170>.
- Gierveld, J.D.J., Van Tilburg, T., 2006. A 6-item scale for overall, emotional, and social loneliness: confirmatory tests on survey data. *Res. Aging* 28, 582–598. <https://doi.org/10.1177/0164027506289723>.
- Griffin, S.C., Williams, A.B., Mladen, S.N., Perrin, P.B., Dzierzewski, J.M., Rybarczyk, B.D., 2019. Reciprocal effects between loneliness and sleep disturbance in older Americans. *J. Aging Health.* <https://doi.org/10.1177/0898264319894486>.
- Kay-Stacey, M., Attarian, H., 2016. Advances in the management of chronic insomnia. *BMJ* 354, 1–14. <https://doi.org/10.1136/bmj.i2123>.
- Kroenke, K., Spitzer, R.L., Williams, J.B.W., 2003. The patient health questionnaire-2: validity of a two-item depression screener. *Med. Care* 41, 1284–1292. <https://doi.org/10.1097/01.MLR.0000093487.78664.3C>.
- Lauriola, M., Carleton, R.N., Tempesta, D., Calanna, P., Socci, V., Mosca, O., Salfi, F., Gennaro, L.De, Ferrara, M., 2019. A correlational analysis of the relationships among intolerance of uncertainty, anxiety sensitivity, subjective sleep quality, and insomnia symptoms. *Int. J. Environ. Res. Public Health* 16, 7–9. <https://doi.org/10.3390/ijerph16183253>.
- Li, S.H., Graham, B.M., 2017. Why are women so vulnerable to anxiety, trauma-related and stress-related disorders? The potential role of sex hormones. *Lancet Psychiatry* 4, 73–82. [https://doi.org/10.1016/S2215-0366\(16\)30358-3](https://doi.org/10.1016/S2215-0366(16)30358-3).
- Soldatos, C.R., Dikeos, D.G., Paparrigopoulos, T.J., 2003. The diagnostic validity of the Athens Insomnia Scale. *J. Psychosom. Res.* 55, 263–267. [https://doi.org/10.1016/S0022-3999\(02\)00604-9](https://doi.org/10.1016/S0022-3999(02)00604-9).

Panteleimon Voitsidis*, Ioannis Gliatas, Vasiliki Bairachtari, Kalliopi Papadopoulou, Georgios Papageorgiou, Eleni Parlapani, Markos Syngelakis, Vasiliki Holeva, Ioannis Diakogiannis
 1st Department of Psychiatry, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece
 E-mail address: pvoitsid@gmail.com (P. Voitsidis).

* Corresponding author at: 1st Department of Psychiatry, Aristotle University of Thessaloniki, General Hospital “Papageorgiou”, Ring Road Thessaloniki, N. Efkarpia, 54603 Thessaloniki, Greece.