Prevalence and variables associated with insomnia among COVID-19 survivors in Colombia

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Abstract. Background and aim of the work. The prevalence of insomnia is higher in COVID-19 survivors. However, there is little information about his associated variables. The aim of the study was to know the prevalence and variables associated with insomnia among COVID-19 survivors in Colombian adults.

Method. Three hundred and thirty COVID-19 survivors participated in a cross-sectional study. Insomnia was quantified with the Athens Insomnia Scale (cut-off score ≤ 6, Cronbach’s alpha of 0.90).

Results. COVID-19 survivors were between 18 and 89 years (Mean = 47.7, SD = 15.2); the majority were women (61.5%), university-educated (62.4%), low income (71.2%), married or free union (66.1%), not healthcare workers (85.8%), without comorbidities (63.0%), asymptomatic or mild COVID-19 (66.1%), duration of COVID-19 symptoms in less than three weeks (80.0%) and remission of symptoms less two months by the day of study participation (73.0%). Scores on the Athens Insomnia Scale were observed between 0 and 24 (M = 7.3, SD = 5.1, Me = 7, IQR = 3 – 10), 60% presented insomnia. Insomnia was associated with post-traumatic stress symptoms (OR = 8.8, 95% CI 2.7 – 29.5), COVID-19 symptoms for more than three weeks (OR = 2.1, 95% CI 1.1 – 3.9), female gender (OR = 1.9, 95% CI 1.2 – 3.2) and married or free union marital status (OR = 1.8, 95% CI 1.1 – 3.0). Conclusion. The frequency of insomnia in COVID-19 survivors is high and mainly related to post-traumatic stress, symptoms of COVID-19 for more than three weeks, and the female gender. It is necessary to implement follow-up studies over time to evaluate the persistence of insomnia.

Key words: Coronavirus disease; survivors; sleep disorders; insomnia; cross-sectional studies

Introduction

Insomnia is the inability to fall asleep or stay asleep (1). According to measurement techniques, before the COVID-19 pandemic, conciliation insomnia in the general population was observed between 15% and 42%, maintenance in 13% (2), and early awakening in 12% (3).

Insomnia can present as a unique problem, or it can be found in people with medical comorbidities, such as chronic pain syndromes (1). Likewise, insomnia can be an associated symptom in most mental disorders, for example, anxiety, depression, or significant cognitive impairment (4).

Insomnia is clinically significant because it significantly impairs general health and psychological well-being (5, 6). Insomnia is associated with a lower capacity to respond and recover effectively from traumatic events such as armed conflicts, natural disasters, terrorist attacks, epidemics, or confinement (7–9).

There are several instruments to assess insomnia in different populations (10). The Athens Insomnia Scale (AIS) is one of those instruments used and has shown high sensitivity and specificity to screen cases of insomnia (11). For example, in the general population, the prevalence of insomnia, quantified with AIS, was observed in 11% of 1,685 official employees in Japan (12), 27% in 1,325 women in menopause in...
Information on the prevalence and variables associated with insomnia in COVID-19 survivors is scarce. Globally, Colombia is among the top ten countries with the highest number of reported cases in Latin America; it is the third country, after Brazil and Argentina (26). It is important to identify cases of insomnia in COVID-19 survivors, given the negative consequences on physical and mental health in the short and long term (27).

Exploring the frequency and associated variables in COVID-19 survivors provides the necessary information to guide follow-up actions in the recovery of COVID-19 survivors (28). Possibly, routine follow-up is limited to reviewing the course of symptoms of “post-COVID-19 syndrome” and forgetting to explore the impact on the sleep pattern of survivors (29). In clinical care, identifying and treating insomnia in COVID-19 survivors is vital to promote quality of life, well-being, and functionality (30).

The study’s objective was to evaluate the prevalence and variables associated with insomnia among COVID-19 survivors in Santa Marta, Colombia.

**Methods**

**Design and participants**

A cross-sectional study was designed with a convenience sample, and COVID-19 survivors who physically or virtually consulted the specialized pneumology service for symptoms related or not related to COVID-19 participated. It was expected to have a sample of at least 330 COVID-19 survivors. This sample size is adequate to estimate magnitudes of associations and acceptable 95% confidence intervals (95% CI) (31).

**Measurements**

**Athens Insomnia Scale**

The severity of sleep disturbance was measured by the Athens Insomnia Scale (AIS) (11). The scale is a self-assessment instrument designed to quantify sleep difficulty according to the International Classification of Diseases 10th revision (ICD-10) criteria for insomnia.
It consists of eight items: the first five refer to the induction of sleep, awakenings during the night, the final awakening, total duration of sleep, and sleep quality, while the last three refer to well-being, the ability to function, and sleepiness during the day. On this scale, the severity of difficulty sleeping is measured based on a 4-point Likert scale from the last month. Scores range from zero (which means it is not a problem) to three (more acute difficulty sleeping). A cut-off score of 6 has been determined to differentiate patients with insomnia and healthy patients (11). This scale has shown acceptable psychometric performance in Colombia (32). The internal consistency (Cronbach’s alpha) for the scale was 0.90.

**Post-traumatic stress symptoms**

Post-traumatic stress symptoms were assessed with the SPAN. The SPAN is a four-item instrument with five response options: never (0), seldom (1), sometimes (2), often (3), and always (4), with total scores between 0 and 20 (33). Based on a previous Colombian study, scores equal to or greater than twelve were categorized as post-traumatic stress risk (34). In the present study, the SPAN showed high reliability, Cronbach’s alpha of 0.81.

**COVID-19 disease severity**

The clinical aspects of COVID-19 were determined by medical history: number and severity of symptoms, duration of symptoms, home or hospital management, and medical comorbidities.

**Procedure**

The patients were contacted in the pulmonology outpatient service of three health care institutions. Information was provided about the objectives of the study before signing informed consent. Patients completed the online questionnaire between October 12, 2020, and April 30, 2021.

**Data analysis**

In the descriptive analysis, frequencies and percentages were observed for the categorical variables, and mean (M), median (Me), standard deviation (SD), and interquartile range (IQR) were calculated. RD was taken as the dependent variable in the bivariate analysis, and other variables were taken as independent variables. Crude (OR) and adjusted (AOR) associations were estimated. The Greenland recommendations for the association adjustment process were followed; the associations were considered significant or probability values less than 0.20 (35). The final modelling had to fit adequately, that is, show a Hosmer-Lemeshow test with a p-value > 0.10 (36).

**Ethical issues**

The study was reviewed and approved by a research ethics committee of a public university in the Caribbean region, Colombia (Minutes 002 of March 26, 2020), following the Colombian research standard (37) and international regulation for the participation of humans in research (38). The AIS-8 is a free-to-use instrument for research purposes. All participants signed informed consent, did so voluntarily, and did not receive incentives.

**Results**

Three hundred and thirty-seven adult COVID-19 survivors were invited to participate, 97.9% (n = 330) agreed to participate. The ages of the participants were observed between 18 and 89 years (Mean = 47.7, SD = 15.2). The highest percentage of participants were between 18 and 59 years old, women, higher education, living in low-income areas, general population, no medical comorbidity, COVID-19 infection treated at home, symptoms less than three weeks and remission less than two months when participating in the study. More information is presented in Table 1.

Scores on the SPAN were between 0 and 15, [M = 4.1 (SD = 3.7), Me = 3 and IQR = 1 - 6], 13.3% scored for PTSD risk. While, the scores in the AIS were observed between 0 and 24 [M = 7.3 (SD = 5.1), Me = 7 and IQR = 3 - 10], 60.6% presented insomnia.

In the bivariate analysis, insomnia was related to female gender (OR = 1.70, 95% CI 1.09 – 2.67), being married or free union (OR = 1.64, 95% CI 1.03 – 2.61),
Table 1. Description of the participants (N = 330)

| Variable                     | n   | %   |
|------------------------------|-----|-----|
| Age (years)                  |     |     |
| 18 – 59                      | 263 | 79.7|
| 60 or older                  | 67  | 20.3|
| Gender                       |     |     |
| Female                       | 203 | 61.5|
| Male                         | 127 | 38.5|
| Education                    |     |     |
| Primary                      | 29  | 8.8 |
| Secondary                    | 95  | 28.8|
| University                   | 206 | 62.4|
| Income                       |     |     |
| Low                          | 235 | 71.2|
| High                         | 95  | 28.8|
| Marital status               |     |     |
| Married or free union        | 218 | 66.1|
| Single or others             | 112 | 33.9|
| Healthcare worker            |     |     |
| Yes                          | 47  | 14.2|
| No                           | 283 | 85.8|
| Comorbidity                  |     |     |
| yes                          | 122 | 37.0|
| No                           | 208 | 63.0|
| COVID-19 severity            |     |     |
| Without symptoms or mild     |     |     |
| (treated at home)            | 218 | 66.1|
| Moderate or severe           | 112 | 33.9|
| Without symptoms or inferior to three weeks |       |     |
| Yes                          | 264 | 80.0|
| No                           | 66  | 20.0|
| Remission inferior to two months |     |     |
| Yes                          | 241 | 73.0|
| No                           | 89  | 27.0|

moderate or severe COVID-19 symptoms (OR = 1.70, 95% CI 1.05 – 2.75), COVID-19 symptoms longer than three weeks (OR = 2.49, 95% CI 1.33 – 4.66), and post-traumatic stress disorder risk (OR = 10.92, 95% CI 3.30 – 36.07). All associations are presented in Table 2. Finally, after adjusting, only post-traumatic stress disorder risk, COVID-19 symptoms longer than three weeks, female gender, and married or free union were significantly related to insomnia. See Table 3. The model showed an adequate fit (Hosmer-Lemeshow’s test = 2.61, df = 4, p = 0.63).

Table 2. Crude associations for insomnia in COVID-19 survivors

| Variable                                      | OR (95% CI)         |
|-----------------------------------------------|---------------------|
| Older than years old                         | 0.82 (0.47 – 1.41)  |
| Female                                       | 1.70 (1.09 – 2.67)  |
| University education                         | 1.39 (0.88 – 2.19)  |
| High incomes                                 | 1.32 (0.80 – 2.17)  |
| Married or free union                        | 1.64 (1.03 – 2.61)  |
| Comorbidity                                  | 0.81 (0.51 – 1.27)  |
| Moderate or severe COVID-19                  | 1.70 (1.05 – 2.75)  |
| COVID-19 symptoms longer than three weeks    | 2.49 (1.33 – 4.66)  |
| COVID-19 remission inferior to two months    | 0.77 (0.46 – 1.27)  |
| Post-traumatic stress disorder risk          | 10.92 (3.30 – 36.07) |

Table 3. Adjusted associations for insomnia in COVID-19 survivors

| Variable                                      | Adjusted OR (95% CI) |
|-----------------------------------------------|----------------------|
| Post-traumatic stress disorder risk           | 8.84 (2.65 – 29.52)  |
| COVID-19 symptoms longer than three weeks     | 2.05 (1.06 – 3.95)   |
| Female gender                                 | 1.92 (1.16 – 3.19)   |
| Married or free union                         | 1.79 (1.07 – 3.00)   |

Discussion

In 60% of COVID-19 survivors, insomnia is present and is significantly associated with female gender, being married or common-law union, symptomatic of COVID-19 with three or more weeks, and PTSD risk.

In the present study, 60% of COVID-19 survivors had insomnia. This prevalence can be considered high in COVID-19 survivors since other studies documented lower prevalences, 12% in China (8) and 40% in Italy (21). However, the prevalence is less than the 77% observed in Mexico (22). This variability can be explained by methods to quantify insomnia and the demographic of the participants (39). It is necessary to consider that before the COVID-19 pandemic, the prevalence of insomnia quantified with the AIS had highly variable frequencies; nevertheless, reported prevalences did not exceed 50%. For
instance, 11% of Japanese official employees reported insomnia (12), 27% of Colombian menopausal women (13), and 48% of Japanese patients suffering from chronic pain (7). This higher frequency of insomnia in COVID-19 survivors may be mediated by biological factors, a direct effect on the central nervous system, or indirectly psychologically mediated by the perception of stress (40, 41).

In the present study, insomnia is higher in female survivors and married or free union. The findings diverge from what has been observed in other research. For example, in China, 121 survivors, independence between gender and marital status and insomnia was observed (8). Furthermore, a meta-analysis concluded that gender was not associated with insomnia in the population affected by COVID-19 (42). More research is needed that can identify possible biases that explain the disparities (39).

In the current study, COVID-19 symptoms for three or more weeks were related to insomnia. This observation is plausible because survivors with COVID-19 symptoms lasting three weeks or more are highly likely to experience distress and thus increased insomnia. Clinical evidence indicates that insomnia symptoms are persistent among the most distressing chronic symptoms derived from stressful events (40).

Besides, PTSD risk was associated with insomnia in the present study, and this finding is similar to that observed in previous research. Similarly, Mahmoudi et al. (25) observed a statistically significant association between scores for PTSD and insomnia. The association of PSTD symptoms with insomnia is frequent in clinical practice (4). Sleep difficulties are part of the diagnostic criteria for PTSD (24), and insomnia often predicts PTSD symptoms among COVID-19 survivors (43).

Clinical and practical implications

Neuropsychiatric symptoms observed in COVID-19 survivors suggest complex psychological and biological factors (41). Then, the management of COVID-19 survivors requires a holistic approach that considers the possible physical and psychological consequences (30). Primary care and clinical health professionals play a fundamental role in identifying sleep problems in COVID-19 survivors. Insomnia has clinical relevance because it is a risk factor for depression and suicidal behaviours (44).

Study strengths and limitations

This study is one of the few that presents the prevalence and associated variables in a middle-income country with a high notification of COVID-19 cases and survivors in Latin America. However, the study is based on a cross-sectional survey, which means that the causal relationship cannot be established, such as PTSD risk and insomnia. In addition, no history of chronic insomnia was assessed before the pandemic. Longitudinal studies are needed to clarify the causality direction (39). Likewise, insomnia and PTSD risk were assessed with self-report scales that can overestimate prevalences. Future studies should use a clinical interview for diagnostic accuracy (45).

Conclusions

The frequency of insomnia in COVID-19 survivors is high and is mainly associated with the female gender, symptoms of COVID-19 for more than three weeks, and the PTDS risk. Longitudinal studies are needed.

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References

1. Roth T. Insomnia: Definition, prevalence, etiology, and consequences. J Clin Sleep Med. 2007; 3(Suppl.): S7–S10.
2. Dois Y, Minowa M, Okawa M, Uchiyama M. Prevalence of sleep disturbance and hypnotic medication use in relation to sociodemographic factors in the general Japanese adult population. J Epidemiol. 2020; 10(2): 79–86.
3. Zheng W, Luo XN, Li HY, et al. Prevalence of insomnia symptoms and their associated factors in patients treated in outpatient clinics of four general hospitals in Guangzhou, China. BMC Psychiatry. 2018; 18(1): 232.
4. Khurshid KA. Comorbid insomnia and psychiatric disorders: An update. Innov Clin Neurosci. 2018; 15(3–4): 28–32.
5. Bhaskar S, Hemavathy D, Prasad S. Prevalence of chronic insomnia in adult patients and its correlation with medical comorbidities. J Fam Med Prim Care. 2016; 5(4): 780–784.
6. Taylor DJ, Mallory LJ, Lichstein KL, Durrence HH, Riedel BW, Bush AJ. Comorbidity of chronic insomnia with medical problems. Sleep. 2007; 30(2): 213–218.
7. Enomoto K, Adachi T, Yamada K, Inoue D, Nakanishi M, Nishigami T, Shibata M. Reliability and validity of the Athens Insomnia Scale in chronic pain patients. J Pain Res. 2018; 11: 793–801.
8. Xu F, Wang X, Yang Y, et al. Depression and insomnia in COVID-19 survivors: A cross-sectional survey from Chinese rehabilitation centers in Anhui province. Sleep Med. 2021. https://doi.org/10.1016/j.sleep.2021.02.002
9. Geng F, Liang Y, Li Y, Fang Y, Pham TS, Liu X, Fan F. Bidirectional associations between insomnia, post-traumatic stress disorder, and depressive symptoms among adolescent earthquake survivors: A longitudinal multivariate cohort study. Sleep. 2019; 42(11): ssz162.
10. Ali, R. M., Zolezzi, M., Awaisu A. A systematic review of instruments for the assessment of insomnia in adults. Nat Sci Sleep. 2020; 12: 377–409.
11. Soldatos CR, Dikeos DG, Paparrigopoulos TJ, Athens Insomnia Scale: Validation of an instrument based on ICD-10 criteria. J Psychosom Res. 2000; 48(6): 555–560.
12. Takami M, Kadotani H, Nishikawa K, et al. Quality of life, depression, and productivity of city government employees in Japan: A comparison study using the Athens insomina scale and insomnia severity index. Sleep Sci Pract. 2018; 2(1): 1–8.
13. Monterrosa-Castro A, Marrugo-Flórez M, Romero-Pérez I, Chedraui P, Fernández-Alonso AM, Pérez-López FR. Prevalence of insomnia and related factors in a large mid-aged female Colombian sample. Maturitas. 2013; 74(4): 346–351.
14. Altena E, Baglioni C, Espie CA, et al. Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. J Sleep Res. 2020; 29(4): e13052.
15. Voitsidis P, Gliatas I, Bairacharti V, et al. Insomnia during the COVID-19 pandemic in a Greek population. Psychiatry. 2020; 289: 113076.
16. McCall WV, Mensah-Bonsu D, Withers AE, Gibson RW. Short-term insomnia disorder in health care workers in an academic medical center before and during COVID-19: Rates and predictive factors. J Clin Sleep Med. 2021; 17(4): 749–755.
17. Abdullah DM, Musa DH. Insomnia and stress of physicians during COVID-19 outbreak. Sleep Med X. 2020; 2: 100017.
18. Hashim HT, Varney JA, Ramadhan MA, Sarfraz A, Sarfraz Z, Murry K. Insomnia among recovered COVID-19 patients. J Sleep Disord Ther. 2021; 10(3): 328.
19. Tsleelibis A, Lekka D, Sikaras C, et al. Insomnia, perceived stress, and family support among nursing staff during the pandemic crisis. Healthcare. 2020; 8(4): 434.
20. Krupa S, Filip D, Mądrończka-Dąbrowska W, Lewandowska K, Witt P, Ozga D. Sleep disorders among nurses and other health care workers in Poland during the COVID-19 pandemic. Appl Nurs Res. 2021; 59: 151412.
21. Mazza MG, De Lorenzo R, Conte C, et al. Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. Brain Behav Immun. 2020; 89: 594–600.
22. Bautista E, Cortés-Álvarez NY, Vargas-Olmos CR, et al. [Symptoms and psychological effects in survivors of COVID-19]. México; CONCYTEP; 2020.
23. Li Y, Qin Q, Sun Q, Sanford LD, Vgontzas AN, Tang X. Insomnia and psychological reactions during the COVID-19 outbreak in China. J Clin Sleep Med. 2020; 16(8): 1417–1418.
24. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Washington: American Psychiatric Publishing; 2013.
25. Mahmoudi H, Saffari M, Movahedi M, et al. A mediating role for mental health in associations between COVID-19-related self-stigma, PTSD, quality of life, and insomnia among patients recovered from COVID-19. Brain Behav. 2021; 11(5): e02138.
26. [Current situation: new Coronavirus (COVID-19)]. Bogotá: Ministerio de Salud y la Protección Social de Colombia; 2021. Accessed August 6th, 2021. https://www.minsalud.gov.co/salud/publica/PET/Paginas/Covid-19_copia.aspx
27. Short NA, Ennis CR, Oglesby ME, Boffa JW, Joiner TE, Schmidt NB. The mediating role of sleep disturbances in the relationship between post-traumatic stress disorder and self-injurious behavior. J Anxiety Disord. 2015; 35: 68–74.
28. Nasserie T, Hittle M, Goodman SN. Assessment of the frequency and variety of persistent symptoms among patients with COVID-19: A systematic review. JAMA Network Open. 2021; 4(5): e2111417.
29. Stam HJ, Stucki G, Bickenbach J. Covid-19 and post-intensive care syndrome: A call for action. J Rehab Med. 2020; 52(4): jrm00044.
30. Rovere-Querini P, De Lorenzo R, Conte C, et al. Post-COVID-19 follow-up clinic: depicting chronicity of a new disease. Acta Biomed. 2020; 91(9-S): 22–28.
31. Katz MH. Multivariable analysis. Second edition. Cambridge: Cambridge University Press; 2006.
32. Campo-Arias A, Monterrosa-Castro A, Herazo E, Monterrosa-Blanco A. Consistency and internal structure of the Athens Insomnia Scale in Colombian climacteric women. Eur Gynecol Obstetr. 2020; 2(2): 123–136.
33. Meltzer-Brody S, Churchill E, Davidson JR. Derivation of the SPAN, a brief diagnostic screening test for post-traumatic stress disorder. Psychiatry Res. 1999; 88(1): 63–70.
34. Pedrozo-Pupo JC, Campo-Arias A. Depression, perceived stress related to COVID, post-traumatic stress, and insomnia among asthma and COPD patients during the COVID-19 pandemic. Chron Respir Dis. 2020; 17: 1479973120962800.
35. Greenland S. Modeling and variable selection in epidemiologic analysis. Am J Public Health. 1989; 79(3): 340–349.
36. Hosmer D, Taber S, Lemeshow S. The importance of assessing the fit of logistic regression models: A case study. Am J Public Health. 1991; 81(12): 1630–1635.
37. [Resolution 008430 which establishes the scientific, technical and administrative standards for health research]. Bogotá: Ministerio de Salud de Colombia; 1993.
38. World Medical Association. Declaration of Helsinki. Geneva: WMA; 2018.
39. Grimes DA, Schulz KF. Bias and causal associations in observational research. Lancet. 2002; 359(9302): 248–252.
40. Matteson-Rusby SE, Pigeon WR, Gehrman P, Perlis ML. Why treat insomnia? Prim Care Compan J Clin Psychiatry. 2010; 12(1): PCC.08r00743bro.
41. Nakamura ZM, Nash RP, Laughon SL, Rosenstein DL. Neuropsychiatric complications of COVID-19. Cur Psychiatry Report. 2021; 23(5): 1–9.
42. Cénat JM, Blais-Rochette C, Kokou-Kpolou CK, et al. Prevalence of symptoms of depression, anxiety, insomnia, post-traumatic stress disorder, and psychological distress among populations affected by the COVID-19 pandemic: A systematic review and meta-analysis. Psychiatry Res. 2021; 295: 113599.
43. De Lorenzo R, Cinel E, Cilla M, et al. Physical and psychological sequelae at three months after acute illness in COVID-19 survivors. Panminerva Med. 2021. https://doi.org/10.23736/s0031-0808.21.04399-8
44. Hawton K, van Heeringen K. Suicide. Lancet. 2009; 373(9672): 1372–1381.
45. Streiner D, Norman G. Health measurement scales: A practical guide to their development and use. 4th edition. Oxford: Oxford University Press; 2008.

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