Original Article

Association of insomnia disorder with sociodemographic factors and poor mental health in COVID-19 inpatients in China

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ABSTRACT

Purpose: To examine insomnia disorder and its association with sociodemographic factors and poor mental health in 2019 novel coronavirus (COVID-19) inpatients in Wuhan, China.
Design: and Methods: A total of 484 COVID-19 inpatients in Wuhan Tongji Hospital were selected and interviewed with standardized assessment tools. Insomnia disorder was measured by the Chinese version of the Insomnia Severity Index (ISI-7), a total score of 8 or more was accepted as the threshold for diagnosing insomnia disorder.
Results: The prevalence of insomnia disorder in the whole sample was 42.8%. Binary logistic regression analysis revealed that female gender, younger age, and higher fatigue and anxiety severity were more likely to experience insomnia disorder.
Conclusion: Given the high rate of insomnia disorder status among COVID-19 inpatients in Wuhan, China, and its negative effects, follow-up assessments and appropriate psychological interventions for insomnia disorder are needed in this population.

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1. Introduction

The 2019 novel coronavirus disease (COVID-19) epidemic has reached global proportions. The treatment and illness uncertainty of COVID-19 acute infectious pneumonia is associated with physical suffering; additionally, it impacts psychological wellbeing [1]. In China, over 42,000 medical workers (including psychiatrists [2]) from other regions of China have volunteered to work in Hubei province.

Clinically, insomnia disorder is one of the major psychiatric disorders in adolescents; the main manifestations include perceived sleep dissatisfaction, and difficulty in initiating or maintaining sleep [3]. Insomnia disorder, however, is a painful condition that is often associated with cognitive impairment, mood disturbance, and fatigue [4]. In their study, Lai et al., reported a high prevalence of insomnia symptoms (34.0%) in health care professionals who treated coronavirus patients [5]. However, no prior studies have reported the prevalence of insomnia disorder and the associated factors in COVID-19 inpatients. Therefore, we conducted a Web-based survey to examine (1) the prevalence of insomnia disorder in COVID-19 inpatients in Wuhan, the center of an outbreak of COVID-19 in China; and (2) the sociodemographic and clinical correlates of insomnia disorder.

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2. Methods

2.1. Setting and sampling

This cross-sectional study was conducted in Tongji Hospital, one of the isolated infectious hospitals in Wuhan, Hubei province in March 2020. COVID-19 inpatients were invited to participate in an online assessment before their discharge. Inclusion criteria comprised of (1) diagnosis of COVID-19; (2) over the age of 14; (3) Chinese-speaking and able to comprehend the contents of the research interview; and (4) willingness to give informed consent.

The Ethics Committee of the Peking Union Medical College Hospital approved this research protocol and methods (Reference number: S-K1081). All participants provided electronic copies of informed consent.

2.2. Data collection and measures

Participants' socio-demographic and clinical data were collected using a form designed for this study. Participants could easily access the survey by scanning a quick response code (QR).

2.2.1. Insomnia severity

Insomnia severity was measured by the Insomnia Severity Index (ISI-7) [6,7]. The Chinese version of ISI-7 has been validated in Chinese populations (Cronbach's alpha = 0.81) [8]. All items were rated on a five-point scale ranging from 0 (none) to 4 (very). The total score ranges from 0 to 28 and the cut-off score for diagnosing insomnia disorder is ≥ 8 [9].

2.2.2. General mental health

General mental health was assessed using the 12-item General Health Questionnaire (GHQ-12) [10]. The Chinese version of GHQ-12 has been validated in Chinese populations (Cronbach's alpha = 0.79) [11]. Each item score is summed to yield a total score ranging from 0 to 12, with those scoring 4 or more being deemed to have poor mental health status [12,13].

2.2.3. Depressive symptom

The 9-item Patient Health Questionnaire (PHQ-9) was used to identify and measure the presence and severity of depressive symptom [14]. The Chinese version of PHQ-9 has been validated in Chinese populations (Cronbach's alpha = 0.86) [15]. The score ranges from 0 to 3 (0 = "Not at all" to 3 = "Nearly every day") for each item (0–27 total score range), and higher total scores connote more severe depressive symptoms [16].

2.2.4. Anxiety symptom

The anxiety symptom was measured by the Generalized Anxiety Disorder scale (GAD-7) [17]. The Chinese version of GAD-7 has been validated in Chinese populations (Cronbach's alpha = 0.89) [18]. Each item has four response options with scores ranging from 0 to 3 (0 = "Not at all" to 3 = "Nearly every day"), the higher total score (ranges from 0 to 21) signified more severe anxiety [17].

2.2.5. Fatigue severity

Fatigue severity was measured by an 11-point (0 = "no fatigue" to 10 = "worst fatigue") numeric rating scale (NRS).

2.3. Statistical analysis

Data were analyzed using SPSS 25.0 (SPSS). Comparisons between insomnia disorder group and non-insomnia disorder group were conducted using the chi-square test, independent sample Student's t-test, and Mann–Whitney U test, as appropriate. Binary logistic regression analyses with the 'enter' method were used to identify independent of insomnia disorder. Insomnia disorder was the dependent variable, and the independent variables included gender, age, education, marital and inpatient ward types, familial people or community members got infected, ways of getting COVID-19 related information, mental health status, fatigue severity, and the total scores of PHQ-9 and GAD-7. The statistical significance level was set to 0.05 for a two-tailed test.

3. Results

A total of 484 (99.0%) of the 489 COVID-19 inpatients met all participation criteria and completed the assessment. The prevalence of insomnia disorder was 42.8%. Considering the whole sample, the mean ISI score was 7.24 ± 0.258 (95% confidence of interval (CI): 6.73–7.75). Mean ISI score of insomnia disorder group and non-insomnia disorder group were 12.41 ± 0.311 (95% CI: 11.80–13.02), and 3.38 ± 0.149 (95% CI: 3.08–3.67), respectively.

Table 1 presents the sociodemographic and clinical characteristics of the whole sample and separately according to insomnia disorder. Compared to COVID-19 inpatients without insomnia disorder, those with insomnia disorder were more likely to be married, female, and getting COVID-19 related information via social media, poor mental health status, and higher fatigue severity, higher PHQ-9, and GAD-7 total scores.

The independent demographic and clinical correlates of insomnia disorder are displayed in Table 2. Compared to non-insomnia disorder group, insomnia disorder was positively associated with fatigue severity ($p < 0.05$, OR = 1.22, 95% CI = 1.06–1.40), and the GAD-7 total score ($p < 0.001$, OR = 1.30, 95% CI = 1.18–1.44), but negatively associated with male ($p < 0.05$, OR = 0.59, 95%CI = 0.36–0.97) and age ($p < 0.001$, OR = 0.97, 95% CI = 0.97–0.99).

4. Discussion

This is the first study that examined insomnia disorder and its clinical correlates in COVID-19 inpatients in Wuhan, China. In this survey, 42.8% of COVID-19 inpatients reported insomnia disorder. This finding is supported by previous studies, that up to 96.2% of clinically stable COVID-19 patients reported post-traumatic stress symptoms [19]. The post-Severe Acute Respiratory Syndrome (SARS) group also reported more sleep disturbances, which was tested by the Sleep Assessment Questionnaire [20]. The sleep quality of the adult individuals who had self-isolated during the epidemic of COVID-19 in China is (8.482 ± 4.646), which was measured by the Pittsburgh Sleep Quality Index (PSQI) questionnaire [21]. The prevalence of insomnia disorder in community-dwelling older people was 17.7% in Taiwan, China, which was considerably lower than our study (42.8%) [22]. The inconsistency may be partly because of the variance in measures of sleep quality, study population, and sample size.

Females are more affected by insomnia disorder compared to males as reported by Roth [23], which is consistent with the findings of this study. Women older than 45 years are 1.7 times more likely to have insomnia than men [24]. The sex difference could

Table 1
Demographic and clinical characteristics of the whole sample and separately by insomnia disorder.

Variables	Total sample (N = 484)		Patients with insomnia disorder (N = 207)		Patients without insomnia disorder (N = 277)		Statistics[a]		
	n	%	n	%	n	%	χ^2	df	P
Male gender	241	49.8	84	40.6	157	56.7	12.2	1	**<0.001**
Married	444	91.7	196	94.7	248	89.5	4.2	1	**0.042**
Education (College degree and above)	193	39.9	89	43.0	104	37.5	1.5	1	0.226
General ward	394	81.4	164	79.2	230	83.0	1.1	1	0.287
Family members got infected	264	54.5	116	56.0	148	53.4	0.3	1	0.568
Colleagues got infected	58	12.0	31	15.0	27	9.7	3.1	1	0.080
Friends got infected	38	7.9	20	9.7	18	6.5	1.6	1	0.200
Getting COVID-19 related information via chatting	216	44.6	99	47.8	117	42.2	1.5	1	0.221
Getting COVID-19 related information via social media	352	72.7	163	78.7	189	68.2	6.6	1	**0.010**
Getting COVID-19 related information via watching television	253	52.3	99	47.8	154	55.6	2.9	1	0.090
Poor mental health status[b]	141	29.1	113	54.6	28	10.1	113.5	1	**<0.001**
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**t**	**df**	**P**
Age (years)	52.5	14.3	53.0	13.8	52.1	14.6	0.7	482	0.484
PHQ-9 total score	5.1	5.2	8.6	5.2	2.5	3.5	14.6	340	**<0.001**
GAD-7 total score	4.0	4.7	7.2	4.9	1.6	2.6	15.1	288	**<0.001**
Fatigue severity	2.7	2.2	3.9	2.1	1.8	1.8	11.6	405	**<0.001**

COVID-19, the novel coronavirus disease; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder Scale-7.
[a] Comparison between Insomnia disorder and Non-insomnia disorder; Bolded values P < 0.05.
[b] Measured by the General Mental Health-12, and the cut-off total score for poor mental health is ≥ 8.

Table 2
Independent demographic and clinical correlates of insomnia disorder (multiple logistic regression analysis).

	Insomnia disorder		
	P	OR	95%CI
Male gender	**0.038**	0.59	0.36–0.97
Married	0.845	0.93	0.42–2.03
Education (College degree and above)	0.608	1.15	0.68–1.95
General ward	0.889	1.05	0.55–1.97
Family members got infected	0.094	0.66	0.39–1.08
Colleagues got infected	0.707	1.15	0.55–2.44
Friends got infected	0.577	1.32	0.49–3.55
Getting COVID-19 related information via chatting	0.587	1.15	0.70–1.87
Getting COVID-19 related information via social media	0.666	0.89	0.53–1.50
Getting COVID-19 related information via watching television	0.099	0.66	0.41–1.08
Poor mental health status[a]	0.079	1.74	0.94–3.24
Age (years)	**<0.001**	0.97	0.96–0.99
PHQ-9 total score	0.059	1.09	1.00–1.18
GAD-7 total score	**<0.001**	1.30	1.18–1.45
Fatigue severity	**0.005**	1.22	1.06–1.40

Bolded values: P < 0.05.
COVID-19, the novel coronavirus disease; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder Scale-7.
[a] Measured by the General Mental Health-12, and the cut-off total score for poor mental health is ≥ 8.

result from hormonal differences since insomnia emerges after the onset of menses in adolescence [25]. Negative effects such as anxiety and depression may cause insomnia [26]. Women are nearly twice as likely to suffer from depression compared with men, which may partially explain the increased insomnia disorder risk for females [27]. However, the positive association that we found between insomnia disorder with married marital status, getting COVID-19 related information via social media, higher PHQ-9 total score, and poor mental health status in univariate analysis disappeared in multivariate analysis, which suggested there may be variables mediating or moderating these associations.

In this study, younger age was a risk factor for insomnia disorder. Younger COVID-19 patients may prefer to spend more time using the internet and smartphones, and some negative news on social media may cause a higher prevalence of insomnia disorder [19]. In addition, younger patients are biologically more vulnerable to sleep deficiency [28], together with lifestyle factors, such as electronic media use may help explain the positive relationship between younger age and insomnia disorder.

The positive association between fatigue, anxiety, and insomnia disorder was observed in this study. Fatigue has been reported as one of the most frequent complaints of patients with insomnia [29]. Notably, fatigue is associated with many negative psychological outcomes, such as cognitive impairment [30] and depression [31], which may increase the risk of insomnia disorder [32,33]. Consistent with previous findings [34–36], a higher level of anxiety was positively associated with insomnia disorder in this study. The large-scale outbreak of COVID-19 has caused public panic and

mental health stress, physical discomfort, and uncertainty during isolation treatment, which may also increase patient anxiety [37].

There are several methodological limitations in this study. First, the study involved only patients attending in general wards and Intensive Care Unit in Tongji hospital in China, and 81.4% COVID-19 patients isolated and treated in general wards. Therefore, the sample was heterogeneous, which may limit the generalizability of the study findings. Second, considering the statistical power, some other factors, such as COVID-19 severity status, clinical symptoms and comorbidities, which may have an impact on insomnia, were not analyzed. Third, the cross-sectional design precludes making causal inferences. Besides, the self-reported clinical characteristics may cause reporting bias.

In conclusion, this study found that nearly half of the COVID-19 patients analyzed suffered from insomnia disorder during hospitalization. Future research should, therefore, include follow-up assessments and appropriate psychological interventions.

Ethical issues

This research protocol and methods were approved by the Ethics Committee of the Peking Union Medical College Hospital (Reference number: S-K1081).

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Description of authors' roles

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Conflict of interest

None.

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: https://doi.org/10.1016/j.sleep.2020.06.011.

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