

Sleep quality and sleep patterns among recovered individuals during post-COVID-19 among Jordanian

A cross-sectional national study

Sawsan Abuhammad, PhD^{a,*} , Karem H Alzoubi, PhD^{b,c}, Omar F Khabour, PhD^d, Shaher Hamaideh, PhD^e, Basheer Khasawneh, PhD^{e,f}

Abstract

This study aims to investigate sleep patterns and quality in patients who had SARS-CoV-2 (COVID-19) infection and to determine the sleep quality and pattern among patients. A cross-sectional design was used to assess sleeping patterns during the post-COVID-19 era for recovered individuals from April 1st, 2022, to June 1st, 2022. The participants had to meet the following requirements: both genders, ages 18 to 70, and previously infected with COVID-19. The prevalence of low sleep quality among the recovered individuals during post-COVID-19 era was 834 (40.6%), and the prevalence of disturbance in sleep quality was 1308 (63.6%). Lower economic status and younger ages in twenties and thirties experienced more disturbances in sleep patterns than other older ages. Many predictors were determined the quality of sleep. These predictors were age ($B = .105$, $P = .00$), income ($B = .05$, $P = .035$) and educational level ($B = .20$, $P = .006$). To sum up, our study found that the prevalence of low sleep quality among the recovered individuals during post-COVID-19 era was moderate, and the prevalence of disturbance in sleep quality was high. The predictors of quality of sleep were age, income, and educational level. Practitioners should be trained to evaluate and manage sleep disturbances, as this comprehensive approach has the potential to reduce mental distress and prevent the consequences of sleep disturbances.

Abbreviations: COVID-19 = SARS-CoV-2.

Keywords: COVID-19, quality, recovered individuals, sleep

1. Introduction

Sleep problems and lethargy, as well as neuropsychiatric dysfunction (e.g., dizziness, memory impairment, and attention), are prevalent long-term symptoms of SARS-CoV-2 (COVID-19) infection.^[1] Studies have shown that approximately 30% of people who recovered from COVID-19 suffered post-COVID sleep difficulties that lasted up to a year after the infection.^[2–4] Newly diagnosed insomnia and various sleep disorders, including sleep apnea and restlessness, are consistently cited sleep problems that continue for several months after COVID-19 infection. Given the bi-directional causality between sleep and the immune response, sleep is likely to be essential for recovery in people with COVID-19 infection.^[5] On the 1 hand, sleep is thought to be a crucial modulator of the immune system, so

poor quality sleep can be detrimental to the immune system.^[5,6] Sleep is a critical biological function for preserving one's health and well-being by regulating the body's internal balance. Sleep quality improves physical and mental health,^[7–9] whereas sleep issues have a detrimental impact on the body's circadian rhythm, which affects the body's immune response.^[5,7,10]

According to a study, the severity of the clinical manifestations of SARS-CoV-2 infection may be linked to circadian rhythm and sleep disruption.^[11,12] There is a link between sleep disturbances and infectious illness hazards, the occurrence and advancement of numerous diseases, including depression and other psychiatric disorders.^[13,14] Despite reports revealing poor in hospitalized patients, sleep quality is important, and sleeping issues in recovered COVID-19 people require more research.^[15,16] Sleep disorders may exacerbate the consequences of COVID-19 on physical and

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^a Department of Maternal and Child Health, Jordan University of Science and Technology, Irbid, Jordan, ^b Department of Pharmacy Practice and Pharmacotherapeutics, University of Sharjah, Sharjah, UAE, ^c Department of Clinical Pharmacy, Jordan University of Science and Technology, Irbid, Jordan, ^d Dept. of Medical Laboratory Sciences, Jordan University of Science and Technology, Irbid, Jordan, ^e Department of Community and Mental Health Nursing, Faculty of Nursing, The Hashemite University, Zarqa, Jordan, ^f Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan.

* Correspondence: Sawsan Abuhammad, Department of Maternal and Child Health, Jordan University of Science and Technology, Irbid 22110, Jordan (e-mail: Shabuhammad@just.edu.jo).

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mental health.^[17] Compared to COVID-19 patients who did not have sleep disturbances, patients with sleep disturbances reported a greater rate of hospital-acquired infections, broader hospital stays, and a more significant requirement for ICU entrance.^[17,18]

Poor sleep quality and patterns have been linked to post-COVID-19 post-traumatic stress disease in Chinese and Italian populations. Moreover, the post-recovery standard of living for many recovered individuals was severely compromised.^[19] It has been demonstrated in several studies that not only adequate sleep reduce the risk of non-communicable diseases^[20] but that it also boosts protection from a variety of viral illnesses, reducing the risk of COVID-19 consequences.^[21,22] It worth to mention this is the first study in Jordan that addressed the sleeping pattern and quality during post COVID-19 era. This study aimed to investigate sleep patterns and quality in patients who had COVID-19 infection and to determine the predictors of sleep patterns and quality during post COVID-19 era.

2. Method

A cross-sectional design was used to assess sleeping patterns during the post-COVID-19 era for recovered individuals from April 1st, 2022, to June 1st, 2022. The participants had to meet the following requirements: both genders, ages 18 to 70, and previously infected with COVID-19. The participants were excluded if they have previous sleeping disorders. The sample size of the study was calculated using G-Power 3.1., Universitat Kiel, Germany (RRID:SCR_013726), based on convenience/quota sample method, small effect size, alpha of 0.05 and power of 0.95. The required minimum number of subjects was 2000. The surveys were sent to 2280 participants

2.1. Instrument

The demographic part includes questions about age, gender, relationship status, educational level, profession, and place of living. The insomnia severity index consists of 7 items that assess: The intensity of sleep-onset (initial); Maintaining sleep (middle); Early in the morning awakening (terminal) problems; Enjoyment with current sleeping habits; Interruption with everyday activities; Noticeability of deficits contributed to the sleeping disorder, and; Level of inconvenience caused by the sleeping disorder. Each of these components is evaluated on a 5-point Likert - type scale ("0" not at all, "4" extremely).^[23] Total ranging from 0 to 28, with higher scores reflecting more severe insomnia. The Cronbach alpha is 0.87.^[24] Sleep quality was measured with number from 0 to 10. As the number increased means better quality of sleeping.

2.2. Data collection

After having the Institutional Review Boards approval from Jordan University of Science and Technology (#70/2022), data collection took a period of 3 months from April until June 2022. The researcher had collected data after approaching the recovered patients from COVID-19. The participants who met the eligibility criteria were invited to participate in this study. Second, the researcher identified himself to the potential participants, explained the nature and purpose of the study, and invited them to participate. Those who agreed to participate in the study received an electronic copy of the consent form with the electronic survey. At the same time, the researcher was available when help was needed.

2.3. Ethical consideration

This study was approved by Jordan University of Science and Technology Institutional Review Boards (#70/2022). The participants agreed to participate after reading the cover page attached to the survey that guarantees anonymity, no obligations to participate, and the right to withdraw at any time.

2.4. Data analysis

The Windows version of the Statistical Package for Social Science (SPSS Version 27, IBM SPSS Stastics, Chicago) was utilized to conduct statistical analysis. The normality of the data was first confirmed using the Kolmogorov–Smirnov testing (1-sample), and then the categorical data were interpreted using numbers and percentages. The term “statistical significance” was used to describe the significance of a (p .05) when multiple regression was used to determine the predictors of sleep quality and sleep patterns.

3. Results

3.1. Demographic characteristics

The study includes 2055 participants of all ages. The response rate was 90%. The number of females was 1182 (57.5), and the number of males was 873 (42.5). See Table 1

3.2. Description of sleep quality and sleep pattern among participants

The prevalence of low sleep quality among the recovered individuals during post-COVID-19 era was 834 (40.6%), and the prevalence of disturbance in sleep quality was 1308 (63.6%).

Regarding sleep quality. The number of participants who reported a score worsened quality of sleep was 60%. The participants reported many sleep problems during the post-COVID-19 era. Regarding sleep difficulty, 52% of participants suffered from moderate to very high degrees. For stay sleep, 52.5% of participants reported difficulty staying asleep. For waking-up early, almost 58 reported moderate to very high level of inability of waking-up early. See Table 2

3.3. Predictors of sleep patterns among recovered individuals

The model was significant ($F = 5.6, P = .01$), which means many predictors determined the sleep pattern. These predictors were age ($B = -.06, P = .037$) and income level ($B = -.49, P = .042$). This means lower economic status and younger ages in twenties and thirties experienced more disturbances in sleep patterns than other older ages. See Table 3

3.4. Sleep quality predictors, according to participants

The model was significant ($F = 5.33, P = .001$). This means many predictors were determined the quality of sleep. These predictors were age ($B = .105, P = .00$), income ($B = .05, P = .035$) and educational level ($B = .20, P = .006$). This means that younger age, less income, and higher educational level experienced low sleep quality compared to others. See Table 4

4. Discussion

To the best of our knowledge, this is the first national study to examine the impact of the COVID-19 era on sleep quality and sleep patterns among recovered individuals from COVID-19 infection. Researchers found that after recovery, COVID-19 patients still complained of poor sleep quality and disturbances in sleep patterns. Many other studies have supported the finding of our study.^[17,18]

4.1. Prevalence and description of sleep quality and sleep disturbances among participants

The present study found that the prevalence of low sleep quality among the recovered individuals during post-COVID-19 era was 40.6%, and the prevalence of disturbance in sleep quality

Table 1
Demographic characteristics of the participants (N = 2055).

Character	Sub-category	Number	Percentage
Gender	Male	873	42.5
	Female	1182	57.5
What is your work status?	Unemployed	849	41.4
	Employed	970	47.2
	Retired	236	11.4
What is your income level in Jordanian Dinar (1JD) = 1.4US\$)	< 400 Jordanian dinars	1117	54.4
	401–800	765	37.2
	> 800	153	8.4
What is your educational level?	≤ Secondary school	529	25.7
	Diploma	248	12.1
	University student	368	17.9
	Bachelor's	695	33.8
	Postgraduate	215	10.5
What is your marital status	Not married	620	30.2
	Married	1435	69.8
Where do you live?	City	1130	55.0
	Village	925	45.0
Do you smoke?	No	1214	59.1
	Yes	841	40.9
How many times did you get COVID-19?	Once	1122	54.6
	Twice	836	40.7
	More than twice	97	4.7
What type of vaccination did you receive?	None	224	10.9
	Pfizer	547	26.6
	AstraZeneca	942	45.8
	Others	342	16.7

COVID-19 = SARS-CoV-2.

Table 2
Response of the participants for the sleep quality (N = 2055).

	Not at all (0)	%	Mild (1)	%	Moderate (2)	%	High (3)	%	Very high (4)	%
Sleep Difficulty	493	24.0	497	24.2	774	37.7	208	10.1	83	4.0
Stay Sleep	494	24.0	490	23.8	750	36.5	243	11.8	78	3.8
Wake Early	424	20.6	442	21.5	669	32.6	367	17.9	153	7.4
Sleep On Physical	353	17.2	570	27.7	634	30.9	371	18.1	127	6.2
Sleep Problem	354	17.2	537	26.1	647	31.5	379	18.4	138	6.7
Anxious Sleep	996	48.5	594	28.9	329	16.0	136	6.6	0	0.0
COVID-19 Impact Sleep	602	29.3	530	25.8	521	25.4	275	13.4	127	6.2

COVID-19 = SARS-CoV-2.

Table 3
Predictors of sleep patterns among participants during post-COVID-19 era (N = 2055).

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	10.190	1.615		6.310	.000
	Age	-.024	.012	-.063	-2.082	.037
	Gender	.358	.313	.032	1.144	.253
	What is your work status?	.162	.111	.040	1.463	.144
	What is your income level in Jordanian Dinar (1JD) = 1.4US\$)	-.381	.188	-.049	-2.031	.042
	What is your educational level?	.003	.094	.001	.035	.972
	What is your marital status?	-.074	.311	-.007	-.239	.811
	Where do you live?	-.009	.251	-.001	-.035	.972
	Do you smoke?	.067	.271	.006	.246	.806

COVID-19 = SARS-CoV-2.

a. Dependent Variable: Sleep patterns.

was 63.6%, regarding the sleep quality. Similarly, the prevalence of poor sleep quality in the public during the COVID-19 pandemic was revealed in many studies based on sleep instrument

instruments scores.^[19,25–27] The consequences of COVID-19-related quarantine on sleep quality from many individuals remain debatable. According to 2 studies, roughly half of the participants'

Table 4

Predictors of sleep quality among participants during post-COVID-19 era (N = 2055).

Model	UN SC B	Std. Error	SC Beta	t	Sig.	95.0 Confidence Intervals for B	
						Lower Bound	Upper Bound
1	(Constant)	5.292	.770	6.875	.000	3.782	6.802
	Age	.019	.005	.105	3.535	.009	.030
	Gender	-.134	.146	-.026	-.920	.358	-.420
	What is your work status?	.028	.052	.015	.542	.588	-.073
	What is your income level in Jordanian Dinar (1JD) = 1.4US\$)	.185	.088	.051	2.112	.035	.013
	What is your educational level?	.000	.044	.020	.006	.995	-.086
	What is your marital status	.000	.003	-.002	-.079	.937	-.006
	Where do you live?	.062	.145	.012	.428	.669	-.222
	Do you smoke?	-.133	.117	-.025	-1.131	.258	-.363
	How many times did you get COVID-19?	-.162	.098	-.037	-1.646	.100	-.355
	What type of vaccine do you have?	.089	.062	.032	1.428	.153	-.033

COVID-19 = SARS-CoV-2.

a. Dependent Variable: sleep quality.

sleep quality deteriorated during the quarantine in Italy and Australia.^[28-30] Similarly, other studies found that almost 33% of participants had worsened sleep quality.^[6,31,32] In the general population, symptoms of sleep disturbance frequently overlapped with many other psychiatric diseases such as depression.^[33] A study among 11 countries found that a quarantine reduced the prevalence of low sleep quality.^[34] The findings could point to societal resilience to the persistent danger of viral infection as well as changes in daily life. The disparities in sleep disturbance proportions and changes across countries may be explained, at least in part, by differences in pandemic control policy and general perception of the COVID-19 crisis.^[16,17] Interestingly, Kocevskaja et al, reported that 20 of pre-pandemic deep sleep had exacerbated sleep issues during postCOVID-19 era, while a 25% of respondents with pre-pandemic low quality sleep had improved sleep during the COVID-19 pandemic.^[35] They contended that the impacts of COVID-19 on sleep quality are not uniform, emphasizing individual differences in response to the COVID-19 crisis.

4.2. Predictors of sleep pattern

Our study found that many predictors were determined the pattern of sleep. These predictors were age and income level. This means lower economic status and younger age in twenties and thirties were experienced more disturbances in sleep pattern than other older ages. A study found an association between the duration of recovery from COVID-19 and the severity of sleep pattern disturbances was shown to be statistically significant,^[36] which is in keeping with a study that sleep patterns and sleep quality were found to be more prevalent. Prevalent in the immediate post COVID-19 (36). This conclusion was also in line with a study that found that sleep disturbances were widespread even 1 year following a critical illness, particularly after intensive care.^[37] According to latest research in 2 countries, females are a greater chance than males of suffering from sleep disorders in China and Italy.^[38,39] Moreover, the study includes age and gender as moderate or severe low quality sleep indicators in the examined population. Patients from urban regions had a positive and statistically significant connection with the average insomnia severity score, consistent with research that revealed that cases following COVID-19 of sleep difficulties were highly prevalent compared to rural regions in metropolitan areas and cities.^[26]

4.3. Predictors of sleep quality

Our study found that many predictors determined the quality of sleep. These predictors were age, income, and educational

level. The effects of age on sleep quality during the COVID-19 pandemic appear contentious. Two studies found that people over the age of 30 were more likely to experience sleep disturbances during the COVID-19 pandemic,^[37,40] correlating with previous findings that the prevalence of low-quality of sleep elevated with age.^[41,42] The age-related worsening sleep quality is because of increased stress that many experiences from COVID-19 infection. On the other hand, data from The Cococel Group revealed a rise in the incidence of low sleep quality in young people aged 18 to 34 years compared to older people.^[43] Two cross-sectional studies consistently reported increased sleep issues in university students from normal to quarantine.^[44,45] It could be understood by their daytime low-quality sleep and stress as a result of significant changes in their daily lives and studies as a result of home COVID-19 quarantine and changes in lifestyle. As a result, it is possible that the impacts of age on sleep during the COVID-19 pandemic are complex and inconclusive and may be impacted by other lifestyle influences.

There is a gender difference in the prevalence of sleep issues. When confronted with the COVID-19 crisis, females appeared to be more prone to sleep problems and decreased quality of sleep than males.^[37,46] On the other hand, a study found that females mentioned a higher sleep quality and low depressive distress compared to males.^[47] Furthermore, other factors impacted living area,^[33,37] education experience,^[48-50] marital status,^[51] and having a mental disorder^[48,52] were also linked to decreasing quality of sleep during the COVID-19 pandemic.

5. Limitations

There are many limitations that facing of this study. Firstly, this study used a cross-sectional study which limit the generalizability of the finding to other participants. Another limitation is using of self-report survey to collect data from the participants. However, the study is included very large number of the participant which restrict the participants to use self-report measure.

6. Implications

The present results indicate that more consideration should be given to individuals who recovered from COVID-19. Access to medical resources for emotional first aid during the pandemic should be improved and possibly delivered via telemedicine.^[53] Acknowledging and treating sleep disturbances is especially important during stressful times such as the COVID-19 pandemic, and practitioners should be trained to evaluate and manage sleep

disturbances, as this comprehensive approach can reduce mental distress and prevent consequences of sleep disturbances.

7. Conclusion

To sum up, our study found that the prevalence of low sleep quality among the recovered individuals during post-COVID-19 era was moderate, and the prevalence of disturbance in sleep quality was high. The predictors of quality of sleep were age, income, and educational level. Our study found that lower economic status and younger ages in twenties and thirties experienced more disturbances in sleep pattern than other older ages. practitioners should be trained to evaluate and manage sleep disturbances, as this comprehensive approach has the potential to reduce mental distress and prevent consequences of sleep disturbances.

Author contributions

Conceptualization: Karem H Alzoubi, Basheer Khasawneh.

Data curation: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Formal analysis: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Funding acquisition: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Investigation: Sawsan Abuhammad, Omar F Khabour, Basheer Khasawneh.

Methodology: Sawsan Abuhammad, Basheer Khasawneh.

Project administration: Shaher Hamaideh, Basheer Khasawneh.

Resources: Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh.

Software: Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Supervision: Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Validation: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Visualization: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Basheer Khasawneh.

Writing – original draft: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

Writing – review & editing: Sawsan Abuhammad, Karem H Alzoubi, Omar F Khabour, Shaher Hamaideh, Basheer Khasawneh.

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