

# Sleep Disturbances among Caregivers of Home-Isolated and Hospitalized COVID-19 Patients: A Multi-National Cross-Sectional Study

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## Abstract

**Background:** Since the coronavirus (COVID-19) pandemic began, several studies were published on the possible prevention and treatment of the disease caused by severe acute respiratory syndrome coronavirus (SARSCoV-2), and its complications. However, one aspect that was overlooked is the impact on the mental health of the caregivers of COVID-19 patients. The current study endeavors to investigate sleep quality disturbances in the caregivers of COVID-19 patients in different countries. **Material and Methods:** This cross-sectional multi-center study was performed between August 1, 2021, and August 30, 2022, across 11 countries. A total of 2411 responses meeting the inclusion criteria (being a family member or caregiver involved in patient care) were collected. The sleep quality was assessed using the self-reported Pittsburgh Sleep Quality Index (PSQI) 12. Total scores ranged from 0 to 21. A  $\geq 5$  indicated poor sleep quality with 89.6% sensitivity and 86.5% specificity. **Results:** A total of 2411 responses meeting the inclusion criteria showed that mean PSQI scores ( $P = 0.3604$ ) were higher in caregivers of hospitalized patients than in patients isolated at home. Approximately 62.4% of caregivers reported sleep quality problems while caring for their patients. **Conclusion:** The results showed that the majority of caregivers of patients with COVID-19 reported disturbances in sleep quality and impaired sleep was more common among caregivers of hospitalized patients, perhaps because hospitalization is associated with a more severe course of the disease. There is a pressing need to take measures to improve the mental health of these caregivers. There should be treatment programs set up to reverse sleep disturbances in this population sufficiently.

**Keywords:** Caregivers, COVID-19, mental health, sleep disturbances, sleep quality

## INTRODUCTION

Since late 2019, the coronavirus (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has raised public health concerns in all healthcare systems around the globe.<sup>[1]</sup> The effect of the pandemic on physical and mental health has been seen over the last two years.<sup>[2]</sup> As we know from previous pandemics,

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**How to cite this article:** Turabi N, Tomar SP, Anyagwa OE, Durganau H, Ishwarya V, Kivan H, *et al.* Sleep disturbances among caregivers of home-isolated and hospitalized COVID-19 patients: A multi-national cross-sectional study. Indian J Community Med 2023;48:676-83.

**Received:** 09-08-22, **Accepted:** 20-07-23, **Published:** 07-09-23

### Access this article online

#### Quick Response Code:



**Website:**  
www.ijcm.org.in

**DOI:**  
10.4103/ijcm.ijcm\_690\_22

COVID-19 has also raised mental health concerns, causing depression, stress, anxiety, and associated phobias.<sup>[3,4]</sup>

Sleep is a crucial component of sustaining good mental health. Proper sleep aids in recovery from mental and physical exertion.<sup>[5]</sup> Sleep disturbances can be an early sign of distress, with anxiety, depression, and suicidal behavior being associated with sleep disturbances.<sup>[6]</sup> The pandemic is altering the daily routine of the people; this has resulted in changes in the sleep pattern for both patients and their caregivers.<sup>[7]</sup> Difficulty falling asleep, short interrupted sleep, sleep initiation or maintenance disorders, altered sleep patterns and dream quality, nightmares, and insomnia have been documented.<sup>[6-9]</sup>

Outcomes of poor sleep include reduced well-being, increased psychological distress, and impaired immune response, which increase the risk of infectious diseases.<sup>[6-9]</sup>

Sleep disturbances among COVID-19 patients have been well documented over the course of the pandemic.<sup>[10]</sup> Based on a meta-analysis conducted in China, in the year 2020, 34% of the patients with COVID-19 experienced sleep disturbances, with infected females having a higher prevalence (52%).<sup>[11]</sup> Furthermore, one of the predominant symptoms of long COVID is the sleep difficulties which can reach up to 26% and is frequently observed in younger patients.<sup>[12]</sup> Caregiving is associated with many negative physical and mental health consequences.<sup>[4]</sup> More significant mental health effects in certain caregiver groups, including females, older caregivers, and those having a marital relationship with the patient, are frequently observed.<sup>[13]</sup> According to studies, family caregivers of intensive care unit (ICU) patients commonly experience anxiety, depression, fatigue, and sleep disturbances.<sup>[14]</sup> 31.8% of non-caregivers compared to 66.6% of unpaid caregivers had one or more adverse mental health conditions, according to a study in the United States.<sup>[15]</sup> Studies have also demonstrated similar effects in caregivers of COVID-19 patients compared to non-caregivers.<sup>[16]</sup> While numerous studies are showing the effect of the COVID-19 pandemic on the health of caregivers in clinical settings, in this study, we aim to estimate the prevalence of sleep disturbance among caregivers of COVID-19 patients at home, with the consideration of different socioeconomic, demographic, physical, and social factors.

## MATERIAL AND METHODS

This was a multi-national (11 countries) cross-sectional study. An online survey form/questionnaire was distributed by investigators from each country who shared it on their social media platforms. The form included online consent signed before responding to the questions. The form also included brief information on the study, inclusion and exclusion criteria, confidentiality, and an anonymity statement to preserve the information and privacy of the participants who volunteered in the survey. Convenience sampling was used in the study.

Participants in this study were anonymous volunteers meeting inclusion criteria.

### Inclusion criteria

We included family members or informal caregivers (Mother, Father, Son, Daughter, Mother-in-Law, Father-in-Law, Daughter-in-Law, Son-in-Law, Grandfather, Grandmother, Granddaughter, Grandson, Sister, Brother, Uncle, Aunt, Niece, Nephew, Wife, Husband, Fiancé/Fiancée, Boyfriend, Girlfriend, Significant other, Friend, Neighbor, Teacher, Student, Co-worker, Classmate, Cousin, Other) who stated to be involved in patient care.

### Exclusion criteria

We excluded patients with a pre-existing history of chronic mental illness from this study.

### Data collection

We collected sample data from 2411 participants from the countries listed in Table 1, with data from participants analyzed with validity across the inclusion criteria. The purpose of the study was described, and informed consent was taken. We obtained responses from participants through a questionnaire constructed using Google Form and divided into 12 sections with detailed questions. Demographic data collected included age, gender, and marital status, occupation of caregiver and patient, country, state, city, area of residence, education level, and income group. The main variables we are focusing this paper on are sleep disturbances among COVID-19 patients' primary caregivers or families. Chosen language of the survey was English to ensure uniformity and the validity of the scales used.

### Statistical analysis

The analysis of the data was done primarily using scores of the PSQI scale, but to provide a better understanding, qualitative analysis was also done on each person's responses to the scales' questions. SPSS Statistics was used in analyzing quantitative variables using (IBM Corp., Armonk, NY) version 27.0 for Windows. To compare all variables and confounders, parametric and non-parametric tests were used in all comparative analyses, which were conducted using conventional statistical tools. The data were first qualitatively evaluated using demographic analysis and normality assumption (Shapiro-Wilk test); qualitative variables were then analyzed using diagrammatic charts; and finally, quantitative data were analyzed using the Student's *t*-test and the analysis of variance (ANOVA) test, which contrasts the scores of the scales that were involved. We assessed psychological responses from the primary caregivers using the Pittsburgh Sleep Quality Index (PSQI) tool for sleep.

Pittsburgh Sleep Quality Index (PSQI)<sup>[12]</sup> is a 19-item, self-rated questionnaire, measures sleep quality and disturbance over the preceding month by evaluating scores across seven components, including sleep duration, sleep disturbance, sleep latency, daytime dysfunction due to sleepiness, sleep efficiency, overall sleep quality, and sleep medication use. Each yields a score ranging

from 0 to 3. Total scores range from 0 to 21. A  $\geq 5$  indicates poor sleep quality and a total PSQI score  $< 5$  indicates good sleep quality. The test has an 89.6% sensitivity and 86.5% specificity.<sup>[12]</sup>

### Ethics and consent

The approval for this study was obtained from the Ethics

Committee of the Faculty of Medicine - Alexandria University, and we provided all participants with written informed consent.

### RESULTS

A total of 2411 individuals from 11 countries participated in our study. The countries were Ethiopia: 257, Indonesia: 237, Malaysia: 129, Mexico: 142, Pakistan: 224, Philippines: 123, Poland: 131, Ukraine: 103, USA: 400, India: 400, and Egypt: 265.

Of the study participants, 42.9% (1034) were male, and 57.1% (1377) were female.

As for socioeconomic position, the majority lived in cities (81%) and were from middle-income families (77.9%). Our participants were mainly between 18 and 29 (66.8%) and 30 and 44 (23%). The patient was the primary source of income in the household for 42.6% of our participants, and 57.1% had dependent members in the family. Table 1 shows more information regarding our population's demographic characteristics.

### Details about the patient's COVID-19 infection

In our study, during the COVID-19 pandemic, 47.7% of participants reported a negative impact of news on their mental health, while 33.6% reported a positive impact [Table 2]. A more significant proportion of our participants (66%) reported suffering from stress, anxiety, or disturbances in sleep quality while caring for the COVID-19 patient. 78.3% of them were interested in learning about significant mental health symptoms and needed consultation, while 48.8% had already tried searching for mental health resources or therapy

**Table 1: Sociodemographic characteristics of study participants (N=2411)**

Sociodemographic characteristics	Frequency (%)
Gender	
Male	1034 (42.9)
Female	1377 (57.1)
Age in years	
18-29	1610 (66.8)
30-44	554 (23.0)
45-59	227 (9.4)
60-85	20 (0.8)
Marital status	
Single	1643 (68.1)
Married	689 (28.6)
Engaged	7 (0.3)
Divorced	54 (2.2)
Widowed	18 (0.7)
Country of residence:	
Egypt	265 (11.0)
Ethiopia	257 (10.7)
India	400 (16.6)
Indonesia	237 (9.8)
Malaysia	129 (5.4)
Mexico	142 (5.9)
Pakistan	224 (9.3)
Philippines	123 (5.1)
Poland	131 (5.4)
Ukraine	103 (4.3)
United States	400 (16.6)
Area of residence	
Urban	1952 (81.0)
Suburban	225 (9.3)
Rural	234 (9.7)
Income group	
Upper	286 (11.9)
Middle	1877 (77.9)
Lower	248 (10.3)
Respondent as a primary source of income in the family	
Yes	714 (29.6)
No	1697 (70.4)
Patient as the primary source of income in the family	
Yes	1026 (42.6)
No	1385 (57.4)
Family size	
4 and below	1186 (49.2)
5 and above	1225 (50.8)
Dependent members in the family	
Yes	1377 (57.1)
No	1034 (42.9)

**Table 2: Details about the patient's COVID-19 infection**

History of COVID-19's impact on mental health	Frequency (%)
How does the news impact the respondent's mental health?	
Positively	809 (33.6)
Negatively	1149 (47.7)
No impact	453 (18.8)
Caregivers experienced a feeling of suffering from stress, anxiety, or disturbances in sleep quality	
Yes	1592 (66.0)
No	819 (34.0)
Caregivers have an interest in learning about mental health symptoms that are important and need consultation	
Yes	1888 (78.3)
No	523 (21.7)
The caregiver has tried searching for mental health resources/therapy	
Yes	1177 (48.8)
No	1234 (51.2)
The caregiver thinks there is a need for psychiatric help for COVID-19 patients and their families	
Yes	2055 (85.2)
No	356 (14.8)

**Table 3: Factors associated with sleep quality (mean PSQI score)**

Variables	N	Mean	SD	p
Gender				
Male	1034	7.855	4.0836	0.002*
Female	1377	7.677	3.7745	
Country of residence				
Egypt	265	8.442	3.3852	<0.001*
Ethiopia	257	8.459	4.3696	
India	400	6.095	3.8266	
Indonesia	237	6.823	3.4313	
Malaysia	129	6.558	4.3695	
Mexico	142	8.049	3.2991	
Pakistan	224	8.317	3.5476	
Philippines	123	7.691	3.3342	
Poland	131	6.733	3.8547	
Ukraine	103	6.922	3.3275	
United States	400	9.585	3.7913	
Was the respondent directly involved in providing care to the patient?				
Yes	1701	8.034	3.9029	0.970
No	694	7.062	3.8553	
Was the patient home isolated or hospitalized?				
Home isolated	1691	7.397	3.8584	<0.001*
Hospitalized (or any other healthcare facility or isolation center)	717	8.598	3.9100	
Does the respondent have a history of diagnosed psychiatric illness?				
Yes	176	9.330	4.1410	0.251
No	2235	7.629	3.8652	
Any cases of severe COVID-19 infection or deaths due to COVID-19 in the neighborhood or among relatives?				
Yes	1627	8.100	4.0019	<0.001*
No	784	7.033	3.6102	
Is the respondent the primary source of income in the family?				
Yes	714	8.901	4.0377	0.006*
No	1697	7.270	3.7531	
Is the patient the primary source of income in the family?				
Yes	1026	8.394	4.0135	0.031*
No	1385	7.279	3.7636	
Family size				
4 and below	1186	7.664	3.8864	0.895
5 and above	1225	7.840	3.9327	
Does the respondent have any dependent members in the family?				
Yes	1377	7.975	3.8178	0.141
No	1034	7.458	4.0129	
Does the respondent have any known history of chronic diseases?				
Yes	578	8.877	3.8133	0.680
No	1833	7.399	3.8742	
Did the respondent experience a feeling of suffering from stress, anxiety, or disturbances in sleep quality while taking care of the COVID-19 patient?				
Yes	1592	8.972	3.7246	<0.001*
No	819	5.985	3.0915	
Is the respondent interested to learn about symptoms of mental health that are important and need consultation?				
Yes	1888	8.068	3.8887	0.755
No	523	6.618	3.7782	
Has the respondent tried searching for mental health resources or therapy?				
Yes	1177	8.717	3.9724	0.013*
No	1234	6.834	3.6197	
Does the respondent think there is a need for psychiatric help for COVID-19 patients and their families?				
Yes	2055	7.954	3.9302	0.084
No	356	6.593	3.5832	

\*p&lt;0.05

options. We also found that 85.2% of participants believe that COVID-19 patients and their families need psychiatric help.

### Factors associated with sleep quality

When sleep quality was compared among the 11 countries using the PSQI scale, poor sleep quality was evident in our sample [Table 3]. Participants from the USA had the poorest sleep quality (mean PSQI score: 9.585), while participants from India were the least affected (mean PSQI score: 6.095). Sleep quality was more negatively affected in male participants ( $P = 0.002$ ), in caretakers of hospitalized patients ( $P < 0.001$ ), and in participants with severe COVID-19 infection or deaths in their neighborhood or among relatives ( $P < 0.001$ ). Furthermore, sleep disturbance was more pronounced among participants who were the primary source of income in the family ( $P = 0.006$ ) and those who had the patient as the primary source of income ( $P = 0.031$ ). Participants who reported feelings of suffering from stress, anxiety, or disturbances in sleep quality while taking care of the patient ( $P < 0.001$ ) also had a greater mean PSQI score compared to participants who denied experiencing such feelings.

Furthermore, other variables that may influence sleep quality among caregivers were also explored, as illustrated in Table 4. The variables that negatively impacted the sleep quality of caregivers and the corresponding categories (with the highest mean PSQI scores) include marital status (divorced), age (30-44 years), lower-income group, year of infection (2019), duration of COVID 19 infection (>20 days), and patient outcome (patient infected at the time of data collection). In contrast, the variables with a positive impact, as indicated by lower mean PSQI scores, were respondents' vaccination status (vaccinated) and patients' vaccination status (vaccinated), each with a  $P$ -value  $\leq 0.001$ .

## DISCUSSION

On March 11, 2020, COVID-19 was declared a global pandemic by the World Health Organization.<sup>[4]</sup> Continuous efforts by health personnel and the general population to curb this pandemic have impacted the physical health aspect and the entire biopsychosocial sphere of each individual involved.<sup>[17]</sup>

Anxiety, stress, depression, sleep disorders, and many other psychiatric illnesses have risen over these two years.<sup>[18]</sup>

There is an established link between sleep disturbances and psychiatric conditions, as they share common causes and exhibit a bidirectional relationship.<sup>[19]</sup> The present investigation was carried out to identify the prevalence of sleep disturbances among the family members or caregivers of COVID-19 patients from 11 countries worldwide, to highlight the global impact of the pandemic.

### Factors associated with sleep quality

Our findings revealed that sleep disturbances vary considerably between countries [Figure 1]. For example, the caregivers and family members of COVID-19 patients in India, Malaysia, and Poland experienced the slightest difficulty in sleeping. However, the level of sleep disturbance experienced is still

significant, as indicated by the mean PSQI score of >5 (6.095, 6.558, and 6.733, respectively), which is also supported by previous studies conducted in these countries.<sup>[18-20]</sup>

In contrast, the USA, Ethiopia, and Egypt had the highest mean PSQI score at 9.585, 8.459, and 8.442, respectively, thus reflecting greater sleep disturbances. This finding is not limited to the caregiver population alone, as we found significant sleep issues among the general public in these countries.<sup>[21,22]</sup>

The findings of our study have also highlighted several important factors that lead to sleep disturbances among caregivers. For instance, the hospitalization of patients was an important influencing factor, which is consistent with findings from another study that has noted a relative's hospitalization in an ICU to be a risk factor for anxiety. Moreover, the risk of depression is increased by restricted visitations in the ICU.<sup>[23,24]</sup>

Our study also found that male participants had more significant sleep disturbances than female participants, with mean PSQI scores of 7.855 and 7.677, respectively. This is inconsistent with the findings of several studies, which noted that females were at higher risk of developing sleep disturbances.<sup>[25-27]</sup> During COVID-19, gender norms meant that women were more likely to be infected by the virus, given their predominant role as caregivers within families and as healthcare workers.<sup>[28]</sup> Nevertheless, the present study's finding illustrates that both genders are significantly affected by the pandemic.

Furthermore, we found that the age group of 30-40 could be a potential risk factor for greater sleep disturbances [Figure 2], which is a rather exciting finding as 30-40 years old, represents the middle-aged group. A systematic review of sleep problems during the COVID-19 pandemic by population found that in the subgroup of COVID-19 patients, higher age is associated with a higher prevalence of sleep problems. However, this finding is reversed in the general population subgroup.<sup>[29]</sup>

Moreover, caregivers in the lower-income group have the highest mean PSQI score (9.190), followed by the middle- and upper-income groups (mean PSQI score: 7.638 and 7.266, respectively). The global economy was significantly impacted by the COVID-19 pandemic, with an estimated drop of 3.9% in global median gross domestic product (GDP) from 2019 to 2020.<sup>[30]</sup> This is a possible explanation for the heightened sleep disturbances faced by respondents in the lower-income group.

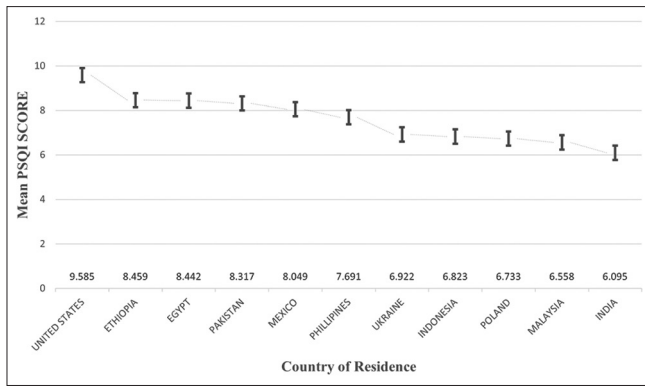
Additionally, the year of infection also played a role, whereby caregivers who had relatives infected in 2019 reported more significant disturbance in sleep quality (mean PSQI: 9.378), followed by the years 2020 and 2021 (mean PSQI: 8.098 and 7.247, respectively).

A study conducted in China revealed that respondents' perception of the death toll and treatment difficulty of COVID-19 significantly affected their sleep.<sup>[31]</sup> Moreover, prolonged infection duration also negatively impacted caregivers' sleep quality [Figure 3].

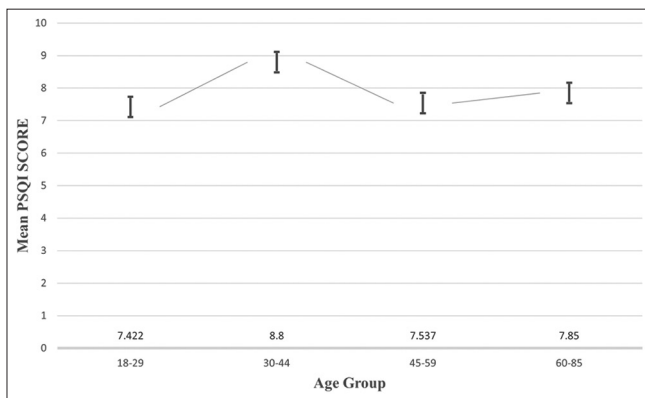
**Table 4: Sleep quality and associated factors**

Variables	Degree of freedom	F	Mean	SD	p
Country	10, 2400	24.212			<0.001*
United States			9.585	3.7913	
India			6.095	3.8266	
Egypt			8.442	3.3852	
Ethiopia			8.459	4.3696	
Indonesia			6.823	3.4313	
Malaysia			6.558	4.3695	
Mexico			8.049	3.2991	
Pakistan			8.317	3.5476	
Philippines			7.691	3.3342	
Poland			6.733	3.8547	
Ukraine			6.922	3.3275	
Marital status	4, 2406	5.606			<0.001*
Single			7.505	3.9073	
Married			8.295	3.8934	
Engaged			6.571	6.2144	
Divorced			8.444	2.9375	
Widowed			8.056	4.3450	
Area of residence	2, 2408	2.353			0.095
Urban			7.685	3.9405	
Suburban			7.804	3.8146	
Rural			8.269	3.7187	
Age	3, 2407	17.661			<0.001*
18-29			7.422	3.8949	
30-44			8.800	3.9189	
45-59			7.537	3.6021	
60-85			7.850	3.4070	
Income group	2, 2408	20.085			<0.001*
Upper			7.266	4.0270	
Middle			7.638	3.7119	
Lower			9.190	4.8350	
Year of infection with COVID-19	2, 2408	27.055			<0.001*
2019			9.378	4.1022	
2020			8.098	3.8457	
2021			7.247	3.8605	
Duration of COVID-19 infection	2, 2408	55.765			<0.001*
<10 days			6.890	3.6920	
10-20 days			7.763	3.7403	
>20 days			9.326	4.2757	
Patient outcome	2, 2408	28.269			<0.001*
Recovered			7.541	3.8684	
Deceased			9.209	3.9829	
Still infected			10.145	3.4663	
Impact of news sources on mental health	2, 2408	51.980			<0.001*
Positively			7.759	3.8851	
Negatively			8.363	3.9143	
No impact			6.196	3.5002	
Respondent's COVID-19 vaccination status	2, 2408	8.813			<0.001*
Fully vaccinated			7.328	3.8814	
Partially vaccinated			8.311	3.8561	
Not vaccinated			7.842	3.9199	
Patient's COVID-19 vaccination status	2, 2408	6.828			0.001*
Fully vaccinated			7.324	3.9305	
Partially vaccinated			8.287	3.9763	
Not vaccinated			7.767	3.8704	

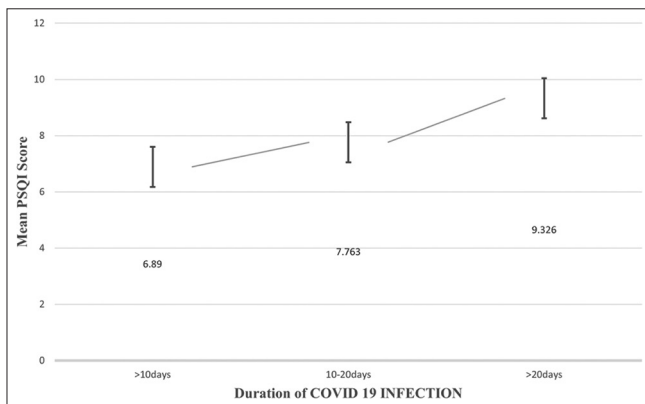
\*p&lt;0.05



**Figure 1:** Mean PSQI scores among caregivers of COVID-19 patients according to country of residence



**Figure 2:** Mean PSQI scores among caregivers of COVID-19 patients across different age groups



**Figure 3:** Mean PSQI scores among caregivers of COVID-19 patients according to duration of infection

In our study, vaccination status against COVID-19 positively affected the sleep quality of participants.<sup>[4]</sup> The findings of our study adequately highlight this.

### The implications of poor sleep quality among caregivers of COVID-19 patients

Several studies have demonstrated the disruption in the sleep cycle due to the COVID-19 pandemic across different

populations. However, to our best knowledge, the global impact on caregivers of COVID-19 patients is yet to be explored, which this study endeavors to do.

### CONCLUSION

Mental health undoubtedly plays a crucial role in the overall well-being of an individual, let alone caregivers of patients of a deadly disease during a pandemic. Poor sleep quality, as reported by PSQI score, was shown in all 11 countries with the USA having the poorest score. The age, gender, income, and marital status of the caregiver had an impact on the caregivers' sleep quality. In addition, poorer sleep quality was seen in caretakers of hospitalized patients and those with more severe or over 20 days of COVID-19 infections. Although caregivers of COVID-19 patients sustained a significant impact on their sleep, there is a lack of interventions targeting them. This study has shown the impact COVID-19 has had and the categories of caregivers that have been most affected. The data should be used to understand this impact and plan treatment programs aiming at the psychological well-being of caregivers.

### Study limitations

Since the questionnaire was self-reported via online electronic mode, the results can be different from data collected via offline mode through physician-administered scales. The questionnaire was made only in one Language: English, which could have limited the number and type of participants.

The sampling was purposive as we could not get access to the national database of COVID patients and their families.

### Acknowledgments

We would like to express our thanks to our study collaborators who helped with the data collection from different country as mentioned: Abed Nego Okthara Sebayang from Indonesia, Faiqa Zaki from Pakistan, Lim Jia Jia from Malaysia, Feven Mekonnen from Ethiopia, Oliwia Dalek from Poland. We express our thanks to Prof. Dr. Maha Ghanem, Chairman of Ethics Committee, Alexandria Faculty of Medicine, for her help in the IRB approval process; to Dr. Professor Vikesh Agrawal, Head of Department of Pediatric Surgery, NSBCMC Jabalpur; and to Innores International Cohort (Yashendra Sethi, Pratik Agrawal, Vidhi Vora, Neeraj Gajwani, Oroshay Kaiwan, Keshav Garg, Adyut Prakash, Snehal Gohel, Siva Sai Belagallu, Nancy Ruiz-Domínguez, Yana Al Inaya, Chrysi Mandola, Aakanksha Singh, Bhawdeep Singla, Maya Abdelwahab, Freya Kankhara, Sudipta Pal, Hoda Walid El Hammady, Shubham Madan, Shraddha Goyal, Udithi Bandaru, Meena Faiez Assad, Kartik Gohel, Koppineedi Satya Bharathi, Akshay Jitendrabhai Gajjar, Michael Azeze Negussie, Ashish Ganatra, Umair Khursheed, Galih Ricci Muchamad, Cristopher Moises Cano-Gonzalez, Mohommad Rayan Rais, Alaa Akrm El Marakby, Jade Simpson, Habiba Samy Farag, Aya Mustafa Dawood, Rehab E. Ashmawy, Juan Carlos Ayala-Alvarez, Ambar Sully-Calderon, Ifat Mabruka, Ahmed K. Awad, Taqwa Emad Alden, Fitsum Assefa from Ethiopia, Janelle Brittany Go from Philippines, Sabrina Zeleke Belay from

Ethiopia) for their help in spreading the questionnaire and support during the study.

### Ethics approval

The study was approved by the Ethics Committee of the Faculty of Medicine - Alexandria University with IRB no. 00012098 and FWA no - 00018699 and all participants were provided with an online written informed consent.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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