

Correlation of Perceived Stress, Sleep Pattern, and Sleep Quality of Adult Residents of the Philippines during the Enhanced Community Quarantine for the COVID-19 Pandemic*

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Abstract

Introduction: The COVID-19 pandemic and subsequent enforcement of enhanced community quarantine in the Philippines has forced residents to stay within the confines of their home, reducing social interaction, and causing changes in the usual routine. The appearance of a novel coronavirus has also brought about an unprecedented period of stress and uncertainty.

Objectives: The primary objective of this study was to determine the perceived stress, sleep patterns, and sleep quality of adult residents of the Philippines during the enhanced community quarantine.

Methods: This was a cross-sectional study which looked at the proportion of adult Filipinos with sleep difficulties during the period of the enhanced community quarantine, together with sleep quality and perceived stress. Three different questionnaires: the Perceived Stress Scale (PSS), the Insomnia Severity Index (ISI), and the Pittsburgh Sleep Quality Index (PSQI) were electronically administered to participants. Their demographic data were also recorded. Correlation between all scores recorded from the Perceived Stress Scale, Insomnia Severity Index, and Pittsburgh Sleep Quality Index were done. All collected data were statistically analyzed through descriptive statistics. Frequency and proportion were used for nominal variables, median and range for ordinal variables, and mean and standard deviation for interval/ratio variables. Pearson's rho/Spearman's rank correlation coefficient were used in determining correlation between PSQI, ISI, and PSS scores.

Results: 301 participants were included. 64% had poor sleep quality on PSQI, and 73% were under moderate perceived stress. 45.5% were not tagged with clinically significant insomnia, while 36.5% were screened to have subclinical insomnia. Pairwise correlations among the PSQI, PSS, and ISI revealed a moderate positive relationship, where higher PSS, ISI, and PSQI scores correlated with higher scores across the three scoring systems. Conclusion: Stress levels were moderately high, and sleep quality was poor during the period of enhanced community quarantine. Majority of participants did not have clinically significant insomnia, but many were found to have subclinical insomnia. Based on our data, higher levels of perceived stress correlated to sleep difficulties and poor sleep quality. These findings suggest that aside from efforts in preventing and treating COVID-19, a premium must also be put on addressing and managing each individual's stress levels and sleep difficulties, and practicing sleep hygiene during the pandemic.

INTRODUCTION

Coronavirus Disease 2019 (COVID-19) first manifested in Wuhan, China as a pneumonia of unknown etiology, and was reported to the World Health Organization on December 31, 2019. Due to the subsequent outbreak, COVID-19 was declared a Public Health Emergency of International Concern on January 30, 2020. As of April 21, 2020, the World Health Organization has recorded a total 2,356,414 confirmed cases worldwide, spanning 213 countries, and resulting to 162,956 deaths.⁵

In the Philippines, the first case of COVID-19, a Chinese national, was reported on January 30, 2020.

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The first case of local transmission was recorded on March 7, 2020.⁶ A steady increase in the number of cases brought about the enforcement of enhanced community quarantine (ECQ) beginning March 16, 2020.⁷ As such, most Filipinos have been forced to stay at home, work from home, participate in online school activities or homeschool children, and reduce social interaction. According to the Department of Health, as of April 21, 2020, the country had a total of 6,599 confirmed cases, with a total of 437 deaths⁸

The sudden appearance of the novel coronavirus around the world brought about a period of stress and uncertainty. These emotions may negatively affect sleep quality², and vice-versa. In a study conducted by Pilcher et al., it was found that poor sleep quality correlated significantly with an increase in negative emotions such as tension, anxiety, depression, anger, fatigue, and confusion. This also correlated with a more negative affect, less satisfaction, and increased psychological and physical health complaints.⁹ In January 2020, a study performed on Chinese nationals under isolation for COVID-19 infection showed a correlation between anxiety levels and stress levels, which resulted to a reduction in the quality of sleep.¹ In addition to having effects on emotions, sleep quality also plays a role in immunity. According to Gamaldo et al., negative effects are seen in the immune response and function in individuals who were sleep deprived and had sleep disruptions.⁴

The enforcement of enhanced community quarantine has forced Filipinos all over the country to remain within the confines of their home, thereby reducing usual levels of physical activity. Most have adopted a work-from-home scheme. Students have been shifted to online modes of learning as well. This shift from the usual routines and levels of physical activity may affect an individual's circadian rhythm, and in turn, their sleep quality.

Currently, there are no published materials on the effect of home isolation during the COVID-19 pandemic on sleep in the Philippines. Considering the unprecedented events surrounding the world at this time, this study aimed to determine whether perceived stress, sleep patterns, and sleep quality of adults residing in the Philippines were affected during the period of enhanced community quarantine.

METHODS

This is a cross-sectional study involving adults who resided in the Philippines during the enhanced community quarantine between March 16, 2020 and May 15, 2020. Data collection began in July 2020 and ended in September 2020.

Inclusion criteria were the following: (1) Individuals aged 18 and older; (2) Individuals who were residing in the Philippines during the enhanced community quarantine between March 16, 2020 and May 15, 2020; and (3) Individuals who consented to take part in the study.

The following were the exclusion criteria: (1) Individuals diagnosed with sleep disorders (eg. Insomnia, Obstructive sleep apnea); (2) Individuals who were taking sleeping pills (eg. Zolpidem, Clonazepam, Alprazolam, Quetiapine); and (3) Individuals who were diagnosed with a neurologic disorder (eg. Stroke).

Subject Selection

All adult Filipinos who were residing in the Philippines during the period of the enhanced community quarantine were enjoined to participate in this study by means of information dissemination through social media outlets (Facebook, Instagram, Twitter).

Informed Consent Process

Information pertaining to the study were posted on social media outlets such as Facebook, Instagram and Twitter. Individuals who were interested in joining the study were asked to click on a link that was provided in the social media post. The link took the interested party to a Google Form containing information about the study, and the informed consent form. The investigator's name and contact details were provided for any questions or clarifications. The participant's willingness and intention to provide answers to the questionnaires were recognized as legitimate consent to participate in the study.

Consenting participants were subject to the inclusion and exclusion criteria. Participants were each be assigned a unique identifier code upon inclusion in the study.

Sampling Method and Randomization

Since this was an online survey, random sampling was impracticable. The inherent nature of online surveys is that of convenience sampling. To offset probable selection bias, we aimed to have a large sample for analysis, and disseminated to a wide variety of channels.

Screening for eligible participants were done online, using the information obtained from the Google Forms specific to the study. If the person fit the inclusion criteria, did not fit into any of the exclusion criteria, and was willing to participate, after obtaining informed consent, data collection began with a series of demographic questions, and questions about the conditions of the individual's living and sleeping environment. Because data collection ensued in varying environments, the questions tried to see if limitations or confounders could be identified, such as high scores being related to sleeping in a crowded and noisy room. Besides looking into test conditions, the Google Form confirmed the person's identity by requiring them to complete a captcha.

Data Gathering

Demographic data such as age, sex, marital status, and city or municipality of residence were recorded. Employment status was also noted. The nature of the participant's residence, whether a house, condominium, or apartment were noted. They were also asked regarding the number of persons they shared their residence with, and the number of persons who shared their bedroom. Three (3) questionnaires, in electronic form via Google Forms, were given to each participant in order to measure his/her level of stress, sleep pattern, and sleep quality. The scores from all questionnaires were recorded and interpreted accordingly. All respondents were also asked regarding bedtimes and rise times two (2) months prior to and during ECQ. They were also be asked to compare the quality of their sleep two (2) months prior to and during ECQ using a 3- point likert scale (better, same, worse).

Data Management, Archiving, and Confidentiality

Google Forms was used for the study. Age, sex, and city or municipality of residence were the only identifiers that were asked for in this study.

Procedures Done to Subjects

Information pertaining to the study were posted on social media outlets such as Facebook, Instagram and Twitter. Individuals who were interested in joining the study were then asked to click on a link that was provided in the social media post. The link took the interested party to a Google Form containing the informed consent form. Once the individual consented to participate in the study, he/she was directed to the data collection form, together with three short questionnaires via Google Forms: 1) the Perceived Stress Scale (PSS); 2) the Insomnia Severity Index (ISI); and 3) the Pittsburgh Sleep Quality Index (PSQI). Once the questionnaires were accomplished, the participant was asked to submit the Google Form. It is estimated that it took the participant 5-10 minutes to complete all questionnaires. The resulting scores from the questionnaires were reviewed by the investigator, and were analyzed accordingly.

Instruments Used for Measuring Outcome

This study utilized three questionnaires: the Perceived Stress Scale (PSS), the Insomnia Severity Index (ISI), and the Pittsburgh Sleep Quality Index (PSQI). These questionnaires assessed the participant's level of perceived stress, as well as his/her sleep pattern and sleep quality.

The Perceived Stress Scale (PSS) is the most widely used tool in measuring stress. The respondent was asked to rate the frequency of their thoughts or feelings in relation to events which occurred over the past month.¹⁶

The Insomnia Severity Index (ISI) is a seven-item tool which assesses the severity of an individual's difficulties with sleep initiation, sleep maintenance, satisfaction with the current sleep pattern, how the sleep problem interferes with daily function, any noticeable impairments brought about by the sleep problem, and the degree of distress brought about by the sleep problem. Each item is rated on a scale from 0 to 4, with a total score ranging from 0 to 28. Higher scores on the ISI indicate more severe insomnia.¹³

The Pittsburgh Sleep Quality Index (PSQI) is a questionnaire consisting of ten (10) questions to subjectively assess an individual's sleep quality.¹⁷

Follow-up Procedures

This study did not require any follow-up from the participants.

Adverse Events

No adverse events were expected, nor noted, in this study.

Sample Size

A minimum of 253 subjects were required for this study based on a level of significance of 5%, a prevalence of bad or very bad perceived sleep quality in a mandatory quarantine setting due to COVID-19 in Wuhan and surrounding cities in 20.7%¹⁸ with a desired width of confidence interval of 10%, as noted from the reference article by Liu, 2020.¹⁸

Legend:

n = minimum sample size

P = proportion of people with bad/very bad subjective sleep quality = 20.7%

d = absolute error/precision (± 0.05) = 0.10

$Z_{\alpha} = 1.96$

Sample size formula¹⁹:

$$n \geq \frac{Z^2_{\alpha} \times 4 \times P \times (1-P)}{d^2}$$

$$n \geq \frac{1.96^2 \times 4 \times 0.207 \times (1 - 0.207)}{0.10^2}$$

$$n \geq 252.24 \approx 253$$

Data Analysis

Descriptive statistics were used to summarize the general and clinical characteristics of the participants. Frequency and proportion were used for nominal variables, median and range for ordinal variables, and mean and standard deviation for interval/ratio variables. Pearson's rho/Spearman's rank correlation coefficient were used in determining correlation between PSQI, ISI, and PSS scores.

All valid data were included in the analysis. Missing variables were neither replaced nor estimated. STATA 15.0 was used for data analysis.

RESULTS

The 301 study participants who were included in the study had a median age of 33 years, were mostly female (67%), single (58%), and employed (61%). A little over three-fourths (76%) were based in NCR, while two-thirds (67%) lived in a house type of residence. Participants shared their residence and bedroom with a median of 5 (range 1–7) and 2 (range 1–8) other persons, respectively.

For 131 (43%) respondents, sleep quality during ECQ was neither better nor worse in comparison with that before onset of ECQ. Another 43% reported having a worse sleep quality, while 14% claimed to be sleeping better during the ECQ.

Table 1. Demographic profile of patients (n=301)

	Median (Range) Frequency (%)
Age, years	33 (19–75)
Sex	
Male	99 (32.89)
Female	202 (67.11)
Civil status	
Single	175 (58.14)
Married	126 (41.86)
Employment status	
Employed	184 (61.13)
Self-employed	76 (25.25)
Student	19 (6.31)
Unemployed	22 (7.31)
Region of residence	
NCR (Metro Manila)	229 (76.08)
Region IV-A (CALABARZON)	39 (12.96)
Region III (Central Luzon)	12 (3.99)
CAR (Cordillera Administrative Region)	9 (2.99)
Region V (Bicol)	3 (1.00)
Region VII (Central Visayas)	3 (1.00)
Region I (Ilocos)	2 (0.66)
Region VI (Western Visayas)	2 (0.66)
BARMM (Bangsamoro Autonomous Region in Muslim Mindanao)	1 (0.33)
Region XI (Davao)	1 (0.33)
Nature of residence	
House	202 (67.11)
Condominium	58 (19.27)
Apartment	33 (10.96)
Townhouse	4 (1.33)
Compound/Tenement	2 (0.66)
Workplace	2 (0.66)
Number of persons sharing the residence	5 (1–7)
Number of persons sharing the same bedroom with the participant	2 (1–8)
Sleep quality during ECQ compared to before ECQ	
Better	41 (13.62)
Same	131 (43.52)
Worse	129 (42.86)

On PSQI, majority (64%) of participants had poor sleep quality (Table 2). The 25th to 75th percentiles of subscale scores were interpreted as: fairly good to fairly bad (scores 1 to 2) subjective sleep quality; >7 to 6-7 hours (scores 0 to 1) sleep duration; and >85% to 75%-84% (scores 0 to 1) habitual sleep efficiency; and not using sleep medications during the past month (score of 0). For domains indirectly interpreted, the interquartile range of scores were interpreted as: fairly good to very bad (scores 1 to 3) states of sleep latency; fairly good to fairly bad (scores 1 to 2) levels of sleep disturbance; and very good to fairly good (scores 0 to 1) daytime functioning.

On ISI, majority of participants (45.5%) were not tagged with clinically significant insomnia, while 36.5%, 16%, and 2% were screened with subthreshold, moderate, and severe insomnia, respectively.

Based on PSS, slightly under three-fourths (73%) had moderate perceived stress, 15% had low stress levels, and 12% were under high stress.

Table 2. Sleep quality, insomnia severity, and perceived stress

	Median (Range, IQR); Frequency (%)
Pittsburgh Sleep Quality Index	7 (0-18, 4-9)
Good sleep quality (≤5)	109 (36.21)
Poor sleep quality (>5)	192 (63.79)
PSQI domain scores	
Subjective sleep quality	1 (0-3, 1-2)
Sleep latency*	2 (0-3, 1-3)
Sleep duration	1 (0-3, 0-1)
Habitual sleep efficiency	0 (0-3, 0-1)
Sleep disturbances*	1 (0-3, 1-2)
Use of sleep medication	0 (0-3, 0-0)
Daytime dysfunction*	1 (0-3, 0-1)
Insomnia Severity Index	8 (0-26, 5-13)
No clinically significant insomnia (0-7)	137 (45.51)
Subthreshold insomnia (8-14)	110 (36.54)
Moderate clinical insomnia (15-21)	49 (16.28)
Severe clinical insomnia (22-28)	5 (1.66)
Perceived Stress Scale	20 (0-39, 16-23)
Low stress (0-13)	44 (14.62)
Moderate stress (14-26)	220 (73.09)
High stress (27-40)	37 (12.29)

Possible scores range (higher scores indicate worse status): PSQI, 0-21; ISI, 0-28; PSS, 0-40.

All pairwise correlations amongst PSQI, ISI, and PSS global scores revealed moderate, positive relationships ($P < .001$) (Table 3). This means that higher PSS, ISI, and PSQI scores correlated with higher scores across the three scoring systems.

Table 3. Correlation between PSQI, ISI, and PSS scores

	Correlation coefficient	Relationship	P
PSS and ISI	0.563	Moderate, direct	<.001
PSS and PSQI	0.461	Moderate, direct	<.001
ISI and PSQI	0.699	Moderate, direct	<.001

Statistical test used: Spearman's rank correlation.

DISCUSSION

This study assessed whether perceived stress, sleep patterns, and sleep quality of adults residing in the Philippines were affected during the period of enhanced community quarantine. Sleep quality was measured through the Pittsburgh Sleep Quality Index (PSQI). The Insomnia Severity Index (ISI) was used to assess the severity of participants' difficulties with regards to sleep initiation, sleep maintenance, and their satisfaction with their sleep pattern. Stress levels were measured using the Perceived Stress Scale (PSS).

Overall, the majority of participants (64%) had poor sleep quality based on their PSQI scores. Majority (45.5%) of participants did not appear to have clinically significant insomnia, but 36.5% had subthreshold insomnia, and 16% had moderate insomnia. Majority of participants (73%) were under moderate perceived stress, while 12% were under high stress, and 15% were under low levels of stress.

There was a moderate positive relationship found between the scores on the PSS and PSQI, showing that higher perceived stress scores correlated with poorer sleep quality. Likewise, a higher perceived stress score also correlated with a higher score on the ISI, indicating the presence of difficulty initiating and/or maintaining sleep. A similar relationship was also found between the ISI and PSQI, where more severe sleep difficulties correlated with poorer sleep quality. The study found that a higher score on one scoring system correlated with higher scores across all three scoring systems. This shows that increased levels of perceived stress leads to changes in sleep patterns, resulting in sleep difficulties and poor sleep quality.

The presence of novel infectious diseases brings about elevated anxiety and stress levels among the general population. Infectious disease epidemics are also

known to have negative effects on the psychological health even of non-infected individuals.¹ The appearance of COVID-19 in the country and the rest of the world has brought about a period of uncertainty and unprecedented stress. The findings of this study showed that there were high perceived stress scores, and poor sleep quality in adults residing in the Philippines during the period of enhanced community quarantine. This indicates that a premium should be put on the psychological well-being of individuals in community quarantine, as it affects both sleep pattern and sleep quality. Similar findings were seen in a study by Xiao et al.¹, where high anxiety levels and high stress levels were correlated with poor sleep quality. Such stress may be due to limited social interactions brought about by self-isolation, and also due to fear of infection. It is known that negative emotions such as anxiety, stress, and anger are strongly associated with poor quality of sleep.² It is also important to note that sleep quality also influences the immune response in such a way that sleep deprivation and sleep disruptions contribute to negative effects on the immune system response.⁴

Aside from this, poor sleep has also been attributed to an increased risk for developing hypertension and dyslipidemia, as observed by Clark et al in 2016.²⁰

The master circadian clock, located in the suprachiasmatic nucleus, regulates the sleep-wake cycle, and is normally entrained by light-dark cycles, exercise, and feeding schedules, and social cues.¹⁰ Irregularities in circadian regulation usually present with longer sleep-onset latency, later bedtimes and later wake times, multiple daytime naps, less nocturnal sleep, and poor sleep quality.¹¹ In this study, majority of participants were not found to have clinically significant insomnia. However, 36.5% were found to have subclinical insomnia. It is posited that this subclinical insomnia may be due to alterations or irregularities in the timing of exposure to bright light, and a decrease in usual activity levels resulting from home confinement, leading to difficulty in initiating and/or maintaining sleep.³ Since higher stress is also associated with an increased risk of the persistence of insomnia²¹, it is

important that the stress levels of patients coming in with complaints of sleep difficulties be screened, and also managed accordingly. Sleep hygiene, which involves regular bedtimes and rise times, adequate exercise, properly-timed light exposure, and a consistent daily routine, must be discussed with patients in order to maintain a well-regulated sleep-wake cycle.

LIMITATIONS AND RECOMMENDATIONS

Majority of participants were located in the National Capital Region. Sampling was also limited to those who had access to the internet. It is recommended that future studies should have a broader scope, involving more participants in regions outside the nation's capital, and even those who do not have internet access. In this study, individuals previously diagnosed with sleep disorders such as insomnia were excluded. Future studies may focus on whether or not home confinement during the pandemic further affected these conditions.

CONCLUSION

The findings from this study showed that during the period of enhanced community quarantine, stress levels were moderately high, and sleep quality was poor. Although majority of participants did not have clinically significant insomnia, many were also found to have subclinical insomnia. In addition to this, study data suggest that higher perceived stress was correlated to having sleep difficulties and poor sleep quality. This demonstrates that in addition to focusing efforts on the prevention and treatment of COVID-19 infections, the psychological well-being, stress levels, and sleep difficulties encountered by the general population also need to be properly addressed during the pandemic. Sleep hygiene is of paramount importance. Practitioners must also be well-advised regarding the effects of stress on sleep in order to prevent and mitigate both short-term and long-term consequences on the patient's physical and psychological health.

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Appendix 1

Perceived Stress Scale

For each question choose from the following alternatives:

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

- _____ 1. In the last month, how often have you been upset because of something that happened unexpectedly?
- _____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?
- _____ 3. In the last month, how often have you felt nervous and stressed?
- _____ 4. In the last month, how often have you felt confident about your ability to handle your personal problems?
- _____ 5. In the last month, how often have you felt that things were going your way?
- _____ 6. In the last month, how often have you found that you could not cope with all the things that you had to do?
- _____ 7. In the last month, how often have you been able to control irritations in your life?
- _____ 8. In the last month, how often have you felt that you were on top of things?
- _____ 9. In the last month, how often have you been angered because of things that happened that were outside of your control?
- _____ 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix 2

Insomnia Severity Index

Insomnia Severity Index

The Insomnia Severity Index has seven questions. The seven answers are added up to get a total score. When you have your total score, look at the 'Guidelines for Scoring/Interpretation' below to see where your sleep difficulty fits.

For each question, please CIRCLE the number that best describes your answer.

Please rate the *CURRENT* (i.e. *LAST 2 WEEKS*) *SEVERITY* of your insomnia problem(s).

Insomnia Problem	None	Mild	Moderate	Severe	Very Severe
1. Difficulty falling asleep	0	1	2	3	4
2. Difficulty staying asleep	0	1	2	3	4
3. Problems waking up too early	0	1	2	3	4

4. How SATISFIED/DISSATISFIED are you with your CURRENT sleep pattern?

Very Satisfied Satisfied Moderately Satisfied Dissatisfied Very Dissatisfied
0 1 2 3 4

5. How NOTICEABLE to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all A Little Somewhat Much Very Much Noticeable
0 1 2 3 4

6. How WORRIED/DISTRESSED are you about your current sleep problem?

Not at all A Little Somewhat Much Very Much Worried
0 1 2 3 4

7. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) CURRENTLY?

Not at all A Little Somewhat Much Very Much Interfering
0 1 2 3 4

Guidelines for Scoring/Interpretation:

Add the scores for all seven items (questions 1 + 2 + 3 + 4 + 5 + 6 + 7) = _____ your total score

Total score categories:

0–7 = No clinically significant insomnia

8–14 = Subthreshold insomnia

15–21 = Clinical insomnia (moderate severity)

22–28 = Clinical insomnia (severe)

Appendix 3

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI)

Instructions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions. During the past month,

1. When have you usually gone to bed? _____
2. How long (in minutes) has it taken you to fall asleep each night? _____
3. When have you usually gotten up in the morning? _____
4. How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed) _____

5. During the past month, how often have you had trouble sleeping because you...	Not during the past month (0)	Less than once a week (1)	Once or twice a week (2)	Three or more times a week (3)
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dreams				
i. Have pain				
j. Other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s):				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
	Very good (0)	Fairly good (1)	Fairly bad (2)	Very bad (3)
9. During the past month, how would you rate your sleep quality overall?				