Sleep Quality during COVID-19 Lockdown among Young Indian Adults: A Cross-sectional Study

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ABSTRACT

Background: COVID-19 disrupted lives globally, and to combat it, various countries including India imposed lockdown and other restrictions. This study was conducted to estimate the prevalence of poor sleep quality among Indian adults in 18–30-year age-group and factors associated with it during lockdown.

Methods: This was an online survey-based cross-sectional study conducted in May 2020 after 6 weeks of lockdown in India. Information regarding sociodemographic profile, screen time, physical activity, substance use, caffeine intake, and sleep habits during lockdown was collected. Pittsburgh sleep quality index was used to assess the sleep quality. Descriptive analysis was performed.

Results: A total of 244 study participants were included in the study, out of which 59% (144) were males and mean age was 24.1 years. Physical activity was decreased among 138 (56.6%) and screen time of more than 4 hours among 152 (62.3%) study participants. Poor sleep quality was reported by 47.1% (115) and sleep duration was decreased among 24.6% (60) study participants. Younger age, living in a containment zone, optimal use of available time, and decreased sleep duration were found to be associated with poor sleep quality.

Conclusion: Lockdown affected sleep quality of the study participants adversely, delaying sleeping and waking times. It is important to ensure minimum disruption of day-to-day schedule of people even during such restrictions. Living in a containment zone was found to be significantly associated with poor sleep quality. Authorities should see to it that people living in such zones should be given priority and counseled appropriately.

Keywords: Containment zone, COVID-19, Lockdown, PSQI, Sleep quality.

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INTRODUCTION

Sleep is an integral component of overall well-being as almost one-third of a human’s life is spent in sleeping. It has been found that approximately 30–35% general population reported sleep-related problems.1 India has a high prevalence of sleep disorders with one of the studies reporting 33% prevalence of insomnia among adults.2 However, a country-wide prevalence data are unavailable. Sleep deprivation can cause various physical effects, mental health complications and cognitive impairment including fatigue, hypertension, sleepiness, decrease in performance, attention and motivation, poor concentration, and increased risk of workplace and road accidents. It also affects immunity and increases risk of cardiovascular diseases, depression, obesity, and diabetes.3 Sleep gets altered by lifestyle and environmental factors while various external factors like gender, stress, socioeconomic status, general health, etc., can affect sleep quality.4

In 2019, a novel virus was identified and coronavirus disease caused by it was declared a public health emergency of international concern in January 2020. To combat coronavirus disease-2019 (COVID-19), countries across the globe placed many restrictive measures including isolation, quarantine, and nation-wide lockdowns. These restrictions limited the movement of people and confined them to their homes, thereby disrupting the daily routines. India imposed a nationwide lockdown from March 25, 2020, after the first case was detected on January 30, 2020. It was initially introduced for 21 days and later extended up to May 31, 2020.5 Lockdown restrictions disrupted the lifestyle of individuals, thereby raising the possibility of affecting sleep quality. This was evident from findings of a study conducted in Spain in which quality of sleep was poor among the study participants during lockdown.6

The confinement was stressful in itself as individuals shared limited space for a prolonged period with few close interactions. A lack of novel stimuli, disruptions of routine activity, increased parenting responsibilities, especially for women, and altered productivity expectations for those engaged in professional duties from home, in addition to the fear of contracting COVID-19, uncertainty about jobs, economic situation, and the health and safety of loved ones were other changes affecting the individuals.7 People across the globe faced different mental health problems including elevated levels of stress. Stress usually has an inverse relationship with sleep. The effect of stress on sleep quality, timing, and duration is influenced by sleep reactivity. Persons with high reactivity develop insomnia during stressful situations while those without it do not. Thus, home-confinement resulting from lock-down could increase the chances of stress induced disturbed sleep and insomnia.8 The pandemic has also been described as an information epidemic,
with people having constant access to news about negative consequences, along with an increase in “screen time”.

Many studies were conducted to study the mental health of people globally during COVID-19 pandemic. However, there is a paucity of literature evaluating sleep quality among general population during the lockdown in India as previous studies have been conducted either among COVID-19 patients in isolation and quarantine or among healthcare workers. Therefore, this study was conducted to estimate the prevalence of poor sleep quality and factors associated with it, if any, among general population during lockdown in India.

Methods

This was a cross-sectional study conducted during May 2020, after almost 6 weeks of lockdown over a period of one week from May 7, 2020, till May 13, 2020. The study population included individuals above the age of 18 years across the country. Study participants included adults aged more than 18 years who had an access to smartphone and Internet connection. Online survey-based semi-structured questionnaire was used to collect information regarding sociodemographic profile, caffeine consumption, physical activity, smoking, alcohol intake, screen time, and sleep timing during lockdown along with any preexisting comorbidity and history of any drug intake. Socioeconomic status was assessed using BG Prasad scale updated for the year 2020. Sleep quality was assessed using Pittsburgh sleep quality index, which contains 19 self-rated questions to form seven component scores and a global score between 0 and 21. A global PSQI score greater than five showed a sensitivity of 89.6% and specificity of 86.5% (kappa = 0.75, \( p < 0.001 \)) in identifying poor sleepers. Cut-off score of \( \geq 5 \) was used to categorize participants having poor sleep quality and \( \leq 5 \) as having good sleep quality. The questionnaire was pretested on a sample of 20 individuals and required modifications were done based on its results. Pretesting data are not included in the final analysis. The questionnaire link was then circulated through WhatsApp social media platform. The authors sent the link to their contacts who were asked to circulate it further. Single response from each participant was allowed. The link was open for responses from May 7, 2020, to May 13, 2020.

Google Excel sheet containing the responses from study participants was downloaded cleaned for errors and missing information. The data were then analyzed using SPSS version 21.0. Descriptive statistics was used. Frequency and percentages were used for categorical data and mean and standard deviation for continuous variables. Chi-square/Fischer-exact test was applied to study the factors associated with sleep quality among study participants. A \( p \)-value of \( <0.05 \) was considered significant. The study was conducted within the boundaries of Declaration of Helsinki. The survey questionnaire contained a section on information for the study participant and consent form. Privacy and confidentiality of data was ensured. Contact detail of one of the authors was provided to the study participants in case they had any query.

Results

A total of 275 responses were received, out of which 31 were incomplete, so they were excluded and 244 responses were included in the analysis. Mean age of the study participants was 24.1 ± 3.0 years (Range 18–30 years). More than half (58.2%, 142) of the study participants were in 21–25 year age-group. Fifty-nine percent (144) were males and 166 (68%) said they are in a relationship. As per B.G. Prasad scale revised for the year 2020, 170 (69.7%) were classified as social class I (2020) (Table 1).

Table 1: Distribution of study participants according to sociodemographic profile (n = 244)

| Variable                                | Frequency | Percentage |
|-----------------------------------------|-----------|------------|
| Age-groups (in completed years)         |           |            |
| 18–20                                   | 32        | 13.1       |
| 21–25                                   | 142       | 58.2       |
| 26–30                                   | 70        | 28.7       |
| Gender                                  |           |            |
| Male                                    | 144       | 59.0       |
| Female                                  | 100       | 41.0       |
| Relationship status                     |           |            |
| Single                                  | 58        | 23.8       |
| Married                                 | 20        | 8.2        |
| In relationship                         | 166       | 68.0       |
| Number of family members                |           |            |
| Upto 4                                  | 163       | 66.8       |
| 5–8                                     | 74        | 30.3       |
| 9 or more                               | 7         | 2.9        |
| Profession                              |           |            |
| Student                                 | 128       | 52.5       |
| Government service                      | 62        | 25.4       |
| Private service                         | 29        | 11.9       |
| Others                                  | 7         | 2.9        |
| Unemployed                              | 18        | 7.4        |
| Socioeconomic status                    |           |            |
| 1                                       | 170       | 69.7       |
| 2                                       | 74        | 30.3       |
| State of residence                      |           |            |
| Delhi                                   | 97        | 39.8       |
| Haryana                                 | 42        | 17.2       |
| Uttar Pradesh                           | 25        | 10.2       |
| Punjab                                  | 17        | 7.0        |
| Rajasthan                               | 12        | 4.9        |
| Others                                  | 51        | 20.9       |
| Living in a containment zone            |           |            |
| Yes                                     | 51        | 20.9       |
| No                                      | 161       | 66.0       |
| Do not know/not sure                    | 32        | 13.1       |
| Effect of lockdown on job               |           |            |
| Studying/working from home              | 141       | 57.8       |
| No change                               | 72        | 29.5       |
| Unable to continue my profession        | 31        | 12.7       |
| Faced loss of job/income due to lockdown (n = 116) |     |            |
| Yes                                     | 17        | 14.7       |
| No                                      | 99        | 85.3       |
| Time spent on screen                    |           |            |
| <2 hours                                | 21        | 8.6        |

(Contd..)
Table 1: (Contd...)  

| Variable                           | Frequency | Percentage |
|------------------------------------|-----------|------------|
| 2–4                                | 71        | 29.1       |
| >4–6                               | 69        | 28.3       |
| >6                                 | 83        | 34.0       |

Physical activity during lockdown  
Increased: 61 (25.0)  
Decreased: 138 (56.6)  
No change: 45 (18.4)

Tea/coffee intake during lockdown (n = 187)  
Increased: 58 (31.0)  
Decreased: 19 (10.2)  
No change: 110 (58.8)

Alcohol intake during lockdown (n = 85)  
Increased: 2 (2.4)  
Decreased: 55 (64.7)  
No change: 28 (32.9)

Tobacco use during lockdown (n = 34)  
Increased: 10 (29.4)  
Decreased: 11 (32.4)  
No change: 13 (38.2)

Any existing comorbidity  
Yes: 19 (7.8)  
No: 225 (92.2)

Lockdown has given ample time  
Yes: 210 (86.1)  
No: 34 (13.9)

Utilized time effectively (n = 210)  
Yes: 79 (37.6)  
No: 131 (62.4)

Fig. 1: Frequency distribution of global PSQI score

Table 2: Sleep-related characteristics of study participants (N = 244)  

| Variable                           | Frequency | Percentage |
|------------------------------------|-----------|------------|
| Sleep during lockdown              |           |            |
| Increased                          | 128       | 52.5       |
| Decreased                          | 60        | 24.6       |
| No change                          | 56        | 23.0       |
| Sleeps at night by                 |           |            |
| 12 am                              | 73        | 29.9       |
| 2 am                               | 62        | 25.4       |
| 4 am                               | 55        | 22.5       |
| >4 am                              | 54        | 22.2       |
| Wakes up by                        |           |            |
| 8 am                               | 80        | 32.8       |
| 10 am                              | 68        | 27.9       |
| 12 pm                              | 42        | 17.2       |
| >12 pm                             | 54        | 22.2       |
| Sleep quality as per Pittsburgh Sleep quality Index  
Poor: 115 (47.1)  
Good: 129 (52.9)

Table 3: Distribution of study participants according to factors associated with sleep quality (N = 244)  

| Variable                                   | Sleep quality, n (%) |
|--------------------------------------------|----------------------|
| Sleep quality                              | Good | Poor | p value |
| Age-groups (in completed years)            |      |      |        |
| 18–20                                      | 10 (31.3) | 22 (68.7) | 0.030* |
| 21–25                                      | 81 (57.0) | 61 (43.0) |
| 26–30                                      | 38 (54.3) | 32 (45.7) |
| Gender                                     |      |      |        |
| Male                                       | 82 (56.9) | 62 (43.1) | 0.152 |
| Female                                     | 47 (47.0) | 53 (53.0) |
| Relationship status                        |      |      |        |
| Married                                    | 11 (55.0) | 9 (45.0) |
| Single                                     | 89 (53.6) | 77 (44.4) | 0.874 |
| In relationship                            | 29 (50.0) | 29 (50.0) |
Sleep Quality during COVID-19 Lockdown

Table 3

| Occupation                          | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Student                             | 66 (51.6) | 62 (48.4) | 0.108a |
| Government service                  | 34 (54.8) | 28 (45.2) |    |
| Private service                     | 14 (48.3) | 15 (51.7) |    |
| Others                              | 7 (100)   | 0 (0)     |    |
| Unemployed                          | 8 (44.4)  | 10 (55.6) |    |

| Number of family members            | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Up to 4                             | 86 (52.8) | 77 (47.2) | 1.000a |
| 5–8                                 | 39 (52.7) | 35 (47.3) |    |
| 9 or more                           | 4 (57.1)  | 3 (42.9)  |    |

| State                                | n | (%) | p  |
|--------------------------------------|---|-----|----|
| Delhi                                | 51 (52.6) | 46 (47.4) | 0.240 |
| Haryana                              | 17 (40.5) | 25 (59.5) |    |
| Uttar Pradesh                        | 16 (64)   | 9 (36)    |    |
| Others                               | 45 (56.3) | 35 (43.7) |    |

| Socioeconomic status                | n | (%) | p  |
|-------------------------------------|---|-----|----|
| 1                                    | 88 (51.8) | 82 (48.2) | 0.600 |
| 2                                    | 41 (55.4) | 33 (44.6) |    |

| Residing in a containment zone      | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Yes                                  | 18 (35.3) | 33 (64.7) | 0.004a |
| No                                   | 97 (60.2) | 64 (39.8) |    |
| Don't know/not sure                 | 14 (43.8) | 18 (56.2) |    |

| Effect of lockdown on job           | n | (%) | p  |
|-------------------------------------|---|-----|----|
| No effect                           | 40 (55.6) | 32 (44.4) | 0.899 |
| Work from home                      | 73 (51.8) | 68 (48.2) |    |
| Unable to continue                  | 16 (51.6) | 15 (48.4) |    |

| Faced loss of job/income due to     | n | (%) | p  |
| lockdown (n = 116)                   |---|-----|----|
| Yes                                  | 11 (64.7) | 6 (35.3) | 0.352 |
| No                                   | 52 (52.5) | 47 (47.5) |    |

| Time spent on screen (in hours)     | n | (%) | p  |
|-------------------------------------|---|-----|----|
| <2                                  | 9 (42.9)  | 12 (57.1) | 0.256 |
| 2–4                                 | 37 (52.1) | 34 (47.9) |    |
| >4–6                                | 43 (62.3) | 26 (37.7) |    |
| >6                                  | 40 (48.2) | 43 (51.8) |    |

| Alcohol intake during lockdown      | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Increased                           | 2 (100)   | 0 | 0.072a |
| Decreased                           | 23 (41.8) | 32 (58.2) |    |
| No change                           | 17 (60.7) | 11 (39.3) |    |

| Tobacco use during lockdown         | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Increased                           | 3 (30.0)   | 7 (70.0) | 0.504 |
| Decreased                           | 6 (54.5)   | 5 (45.5) |    |
| No change                           | 5 (38.5)   | 8 (61.5) |    |

| Caffeine intake during lockdown     | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Increased                           | 28 (48.3) | 30 (51.7) | 0.460 |
| Decreased                           | 9 (47.4)  | 10 (52.6) |    |
| No change                           | 63 (57.3) | 47 (42.8) |    |

| Physical activity during lockdown   | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Increased                           | 35 (57.4) | 26 (42.6) | 0.691 |
| Decreased                           | 70 (50.7) | 68 (49.3) |    |

| Any existing comorbidity            | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Yes                                 | 8 (42.1)  | 11 (57.9) | 0.327 |
| No                                  | 121 (53.7) | 104 (46.3) |    |

| Lockdown provided ample time        | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Yes                                 | 112 (53.3) | 98 (46.7) | 0.853 |
| No                                  | 17 (50.0)  | 17 (50.0) |    |

| Made use of ample time (n = 210)    | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Yes                                 | 55 (69.6) | 24 (30.4) | 0.000a |
| No                                  | 57 (43.5) | 74 (56.5) |    |

| Sleeping time                       | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Upto 12 am                          | 50 (68.5) | 23 (31.5) | 0.001a |
| Later than 12 am                    | 62 (45.9) | 73 (54.1) |    |

| Waking time                         | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Upto 8 am                           | 41 | 39 | 0.723 |
| After 8 am                          | 88 | 76 |    |

| Sleep duration                      | n | (%) | p  |
|-------------------------------------|---|-----|----|
| Increased                           | 68 (53.1) | 60 (46.9) | 0.002a |
| Decreased                           | 22 (36.7) | 38 (63.3) |    |
| No change                           | 39 (69.6) | 17 (30.4) |    |

*significant association; aFischer-exact test; as per BG Prasad scale updated for the year 2020

Discussion

Lockdown disrupted day-to-day life schedule for entire world and has affected people in multiple ways. The uncertainty about future, fear of contracting the infection, and myths circulating about the disease disturbed the mental health status of individuals. The possibility of such pandemics in future cannot be ruled out; therefore it is important to identify the problems and concerns faced by individuals during such testing times. It will enable the policymakers to decide the future course of action to minimize the suffering among people across the globe. Thus, this study was conducted to assess the sleep quality among adult population during lockdown in India.

Almost half of the study population (115, 47.1%) suffered from poor sleep quality during lockdown. This was similar to the findings of another study conducted by Gupta et al. who found 44.1% study participants having poor sleep quality during lockdown out of which 23.4% reported worsening post lockdown and rest had it even before lockdown. Studies conducted in other countries also showed similar result.11–14 The lockdown restrictions forced people to stay indoors, confined to limited space, especially in LMICs, which could have aggravated stress and anxiety among them. As evident from studies conducted in Jordan and Italy, many study participants had anxiety and depressive symptoms during lockdown and both of these were found to be significantly associated with poor sleep quality among study participants.15,16 Poor sleep for prolonged duration poses an individual at risk of obesity, diabetes, and heart disease.16 Sleep disruption, an important component of sleep...
quality, for a short duration can cause somatic pain, emotional distress, mood disorders, reduced quality of life, enhanced stress responsivity, and deficits in cognition, memory, and performance among healthy adults.\textsuperscript{17}

This proportion was higher as compared to other studies. The reason for this contrast could be due to different timing of the interviews, nonidentical study tool, and different age structures of the study participants.\textsuperscript{15,18,19} Another study conducted in Italy showed that self-perceived sleep quality did not change during lockdown compared to prelockdown.\textsuperscript{20} This could be due to lockdown also provided more time for self-care and taking adequate rest.

Sleep duration was found to be increased among half of the study participants, similar to the findings of Trakada et al.\textsuperscript{18} Approximately 70% reported sleeping after 12 am in night and waking up after 8 am in morning. Delayed waking times were also observed during the lockdown as compared to before the lockdown in another study conducted in Indian population.\textsuperscript{21} Physical activity decreased among more than half of the study participants (138, 56.6%) while 62.3% (152) reported screen time of more than 4 hours. All these factors affect sleep and its quality adversely by disrupting circadian rhythm.\textsuperscript{22}

Significantly higher proportion of younger age-group study participants were found to have poor sleep quality compared to older age-groups, similar to the findings of Trakada et al. Sleep quality deteriorates with age among adults, especially among women.\textsuperscript{23} This was in contrast to findings of Christian et al. in which age was not found to be associated with sleep quality. The reason for difference could be different study tool used to assess the sleep quality and different age distribution.

Gender was not found to be significantly associated with sleep quality during lockdown. This was similar to another study in Jordan. The gender differences in sleep disorders with more women suffering from sleep related problems are more pronounced during puberty, pregnancy, and menopause due to different hormonal and physical changes.\textsuperscript{24} However, the study population in our study was not in pubertal or menopausal age-group. This could be the reason we failed to find out any gender difference in sleep quality. Another explanation could be fewer women are gainfully employed in comparison to males; therefore most of them remain confined to their homes. Hence, the pandemic and the resulting lockdown could have lower effect on women compared to their counterparts. The finding of our study was different from findings of other studies in which more females were found to have poor sleep quality compared to males.\textsuperscript{12,14,18} Marital status and occupation were not found to be significantly associated with sleep quality during lockdown. This was in tune with the findings of other studies.\textsuperscript{11,14}

Poor sleep quality was also reported by a significantly higher proportion of individuals living in containment zone for COVID-19. Heightened fear of contracting the infection and stricter restrictions in containment zones due to higher number of cases in defined geographical vicinity could be the possible reason for poor sleep quality among these study participants. Additionally, the study participants who thought that they have used the ample time available during lockdown efficiently had good sleep quality. This again reinforces the hypothesis that lockdown also had positive influences by providing more time for recreation and self-care to some individuals, thereby improving the sleep quality. Decreased sleep duration was found to be significantly associated with poor sleep quality.

**Strengths**

To the best of our knowledge, this study is among the few conducted in general Indian population to study the effect of lockdown due to COVID-19 on sleep quality. Pretested questionnaire was used. Validated tool (Pittsburgh sleep quality index) was used for assessment of sleep quality.

**Limitations**

This study has certain limitations. As it was an online survey-based study, inherent selection bias could not be ruled out as only those literate individuals with access to smartphone and Internet could participate in the study. Therefore, generalizability of the study results is limited. All the information is based on self-reporting by the study participants. Cross-sectional nature of study has a recall bias, especially for patterns of sleep and activity and temporality cannot be established.

**Conclusion**

We can conclude from our study that the lockdown affected the sleep quality of the study participants adversely, delaying sleeping and waking times. There was increased screen time and decreased physical activity. It is therefore important to ensure that there is minimum disruption of day-to-day schedule of people even when such restrictions are imposed. The harms of increased screen time and reduced physical activity should be communicated to people. Living in a containment zone was found to be significantly associated with poor sleep quality. Authorities should ensure that people living in such zones should be given priority and counseled appropriately. Transparency in information and timely communication should be the key to tackle fears and myths among these populations.

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