



## ORIGINAL ARTICLE

## Disruptions in Sleep due to Prolonged Isolation during Covid-19 Lockdown: A Survey Based Study

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### Abstract

**Background:** Due to the COVID-19 pandemic outbreak most countries have resorted to enforced lockdowns. Being forced to stay home people are prone to succumb to various kind of stressors and may later develop psychological problems like anxiety, depression and insomnia. Taking advantage of this situation we developed a survey to study sleep disruptions due to prolonged isolation.

**Methods:** An electronic survey developed using an online cloud-based website (Survey Monkey®) was served to general population. Participants had a week to voluntarily complete the 5 minute long questionnaire. Descriptive statistics and figures were obtained from surveymonkey.com.

**Results:** Total 231 individuals completed the survey with median age of 30 years and 47.6% were male. 130 (56.2%) believed that their sleep cycle had changed due to lockdown. 58 (25.1%) disagreed and 43 (18.6%) were not sure.

**Conclusion:** Sleep plays a pivotal role in healthy functioning of the human body. Our findings suggest a significant change in the sleep quality in all age groups due to the Covid enforced lockdowns which may later lead to significant health problems. It is recommended that with all other precautions to prevent Covid-19 related illnesses, everyone should follow the sleep hygiene guidelines which will be useful for immunity maintenance.

### Keywords

Sleep, Isolation, Lockdown

### Introduction

The year 2019-20 has seen a worldwide pandemic resulting from severe acute respiratory syndrome Coronavirus 2, also known as COVID19. The outbreak has rapidly spread to most countries and claimed several lives subsequent to its first report in Wuhan, Hubei Province in China in December 2019. The World Health Organization (WHO) declared the COVID-19 to be a pandemic on the 11<sup>th</sup> of March 2020.

As of this date, more than 80 million cases of COVID-19 have been reported in over 210 countries and territories, resulting in more than 1.7 million deaths and > 56 million recoveries. Virus spreads through respiratory droplets and contaminated surfaces and touching face. Due to the highly infectious nature of the virus, infection rapidly spread throughout the world forcing most countries to enforce lockdown to limit the spread of infection and flatten the curve easing the burden on health care system. Under enforced lockdown in half of the world people were more susceptible to psychological stresses and various disorders like anxiety, insomnia and depression. We took this opportunity to study the effects of prolonged isolation on sleep patterns.

### Methodology

A survey was developed on an online cloud-based website (Survey Monkey®). The completely anonymized

questionnaire was designed to cover different aspects related to the Pittsburgh Sleep Quality Index (PSQI).

### Design of the questionnaire

Overall, the questionnaire featured 28 questions, most of which were multichoice. While 4 items were to identify respondent characteristics, 6 and 18 belonged to the exclusion and PSQI set, respectively. The Pittsburgh Sleep Quality Index was administered to evaluate following domains-Sleeps Quality, Sleep Latency, Sleep Duration, Sleep Disturbances, Use of Sleep Medication, Daytime dysfunction and Habitual Sleep Efficiency. Further one question was added to standard questionnaire about the "Change in sleep pattern after lockdown".

The average time to complete the survey was five minutes. The respondents could change the answers before submission but not after it. The first six questions belonged to the exclusion criteria and if answered with a positive response the respondent was immediately disqualified. All questions were mandatory. Internet Protocol address checks were done to avoid duplicated responses from a single respondent. The survey underwent three rounds of cross-fill to check for errors in wording, grammar or syntax.

### Population selection

The questionnaire was served to general population who were aged 18 years and above. The survey was circulated using a web link over email and WhatsApp®. The eligible participants were given a week's time to voluntarily complete the questionnaire from 2<sup>nd</sup> May 2020 to 9<sup>th</sup> May 2020 (during period of lockdown). Informed

consent was taken at the beginning of the survey and no incentives were offered for survey completion.

An exemption from review was obtained from the institute ethics committee of Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow as per local guidelines [1]. We adhered to the Checklist for Reporting Results of Internet E-surveys to report the data. Descriptive statistics were used, and figures downloaded from surveymonkey.com®.

## Results

### Sample size

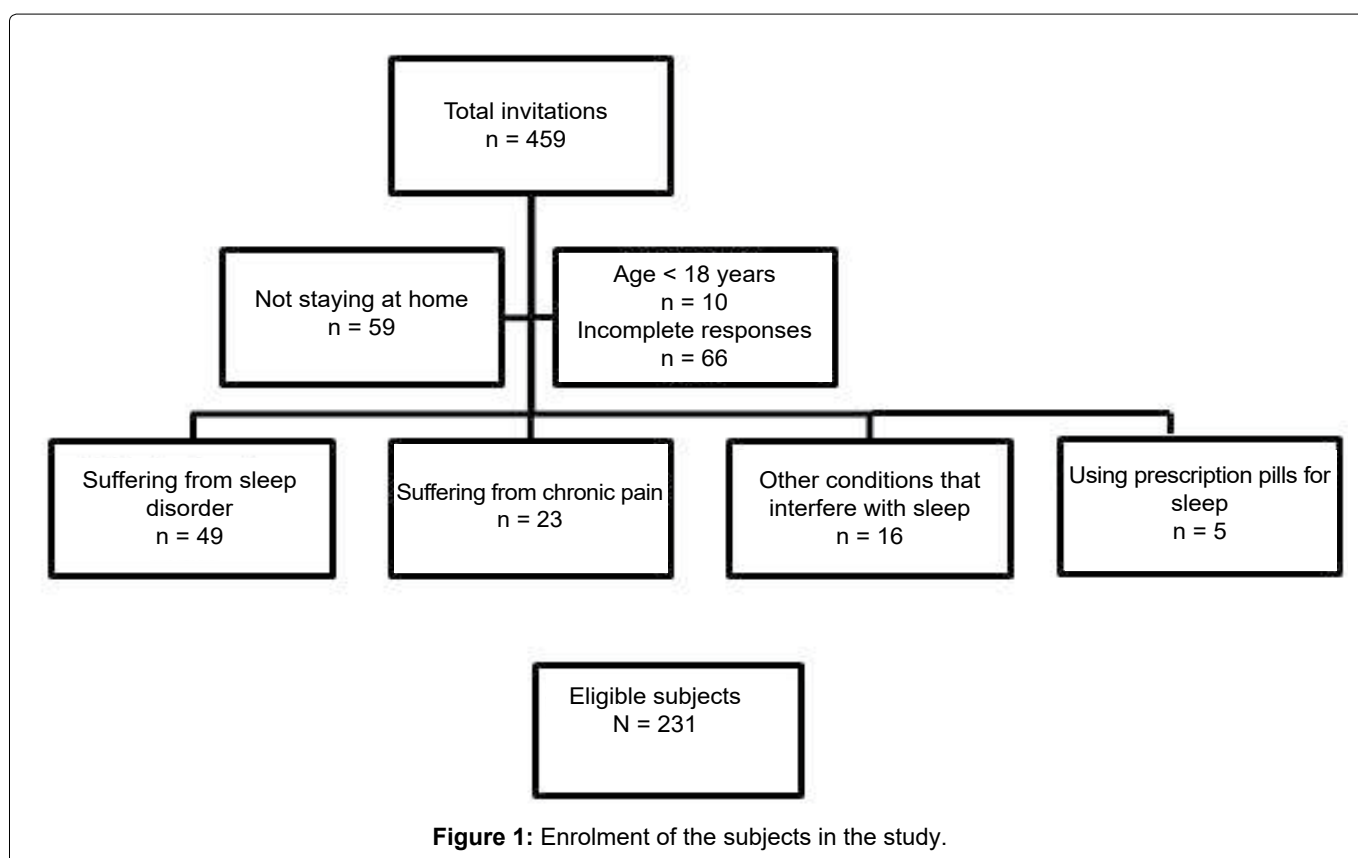
459 individuals responded to the survey of which responses of 231 were complete and qualified for final evaluation. Reasons of exclusion are provided in Figure 1.

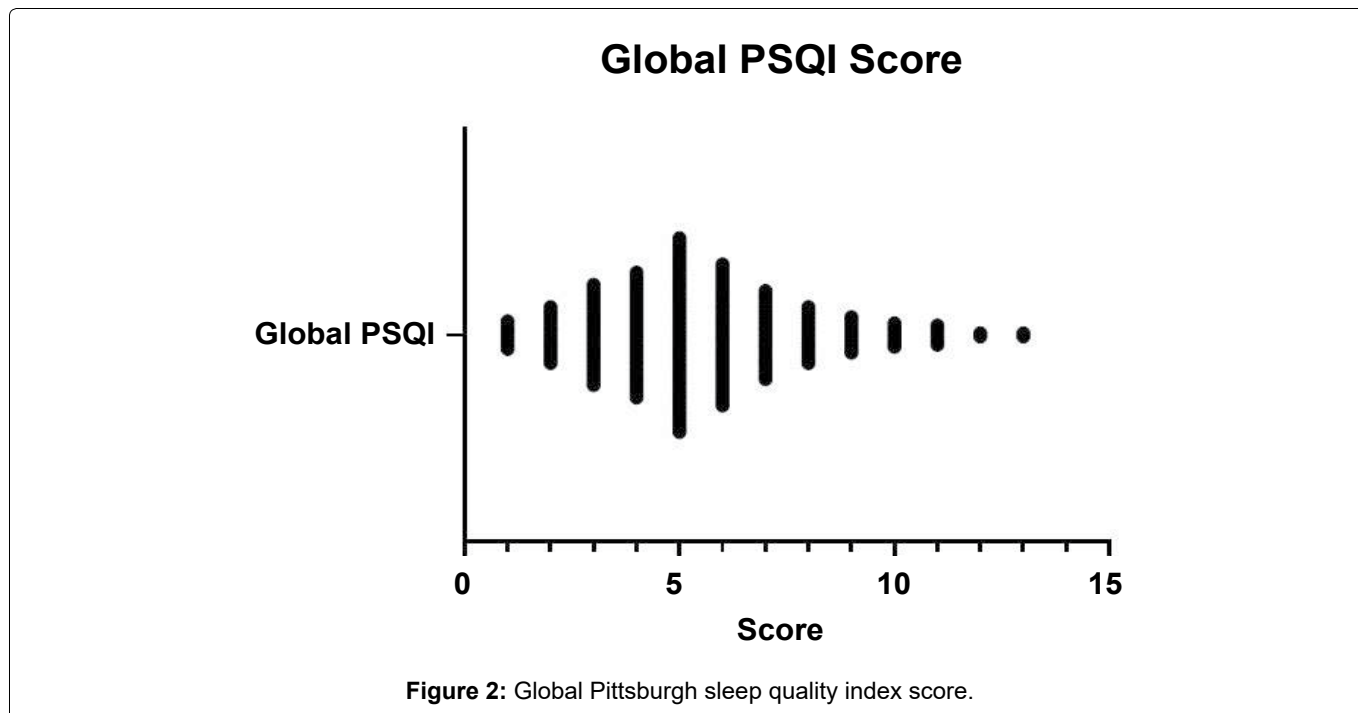
### Respondent characteristics

The median age was 30 years with 110 (47.6%) being males and 121 (52.3%) being females. A majority of respondents were from India 210 (90.9%), while there were 6 (2.6%) from the United States, 5 (2.1%) from Japan, 2 (0.8%) from Tanzania, 1 (0.4%) each from Australia, Ireland, Israel, Malaysia, New Zealand, Russia, South Africa and Uganda.

### Pittsburgh sleep quality indicator index

More than 61% respondents reported going to sleep past midnight and 69% indicated getting up in the morning after 8.00 AM. Almost 44% of the respondents had PSQI global score of 5 or more indicating poor quality of sleep (Figure 2).



**Table 1:** Pittsburgh sleep quality index.

Question	Response
<b>When have you usually gone to bed (time)?</b>	
8-9 PM	0
9-10 PM	2 (1%)
10-11 PM	26 (13.4%)
11- 12 AM	46 (23.8%)
0-1 AM	41 (21.2%)
1-2 AM	22 (11.4%)
2-3 AM	28 (14.5%)
3-4 AM	18 (9.3%)
4-5 AM	8 (4.1%)
5-6 AM	2 (1%)
<b>How long (in minutes) has it taken you to fall asleep each night?</b>	
< 15 minutes	63 (32.6%)
16-30 minutes	92 (47.6%)
31-60 minutes	32 (16.5%)
> 60 minutes	6 (3.1%)
<b>When have you usually gotten up in the morning?</b>	
7-8 AM	60 (31.1%)
8-9 AM	43 (22.2%)
9-10 AM	40 (20.7%)
10-11 AM	18 (9.3%)
11-12 PM	17 (8.8%)
After 12 PM	15 (7.7%)
<b>How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed)?</b>	
> 7	71 (36.7%)
6-7	95 (49.2%)
5-6	21 (10.8%)
< 5	6 (3.11%)

<b>During the past month, how often have you had trouble sleeping because you cannot get to sleep within 30 minutes</b>	
Not during the past month	65 (33.6%)
Less than once a week	38 (19.6%)
Once or twice a week	56 (29%)
Three or more times during a week	34 (17.6%)
<b>During the past month, how often have you had trouble sleeping because you wake up in the middle of the night or early morning</b>	
Not during the past month	109 (56.4%)
Less than once a week	34 (17.6%)
Once or twice a week	31 (16%)
Three or more times during a week	19 (9.8%)
<b>During the past month, how often have you had trouble sleeping because you have to get up to use the bathroom</b>	
Not during the past month	110 (56.9%)
Less than once a week	37 (19.1%)
Once or twice a week	27 (13.9%)
Three or more times during a week	19 (9.8%)
<b>During the past month, how often have you had trouble sleeping because you cannot breathe comfortably</b>	
Not during the past month	174 (90.1%)
Less than once a week	11 (5.7%)
Once or twice a week	8 (4.1%)
Three or more times during a week	0 (0%)
<b>During the past month, how often have you had trouble sleeping because you cough or snore loudly</b>	
Not during the past month	179 (92.7%)
Less than once a week	10 (5.1%)
Once or twice a week	3 (1.5%)
Three or more times during a week	1 (0.5%)
<b>During the past month, how often have you had trouble sleeping because you feel too cold</b>	
Not during the past month	163 (84.4%)
Less than once a week	23 (11.9%)
Once or twice a week	6 (3.1%)
Three or more times during a week	1 (0.5%)
<b>During the past month, how often have you had trouble sleeping because you feel too hot</b>	
Not during the past month	125 (64.7%)
Less than once a week	36 (18.6%)
Once or twice a week	26 (13.4%)
Three or more times during a week	6 (3.1%)
<b>During the past month, how often have you had trouble sleeping because you have bad dreams</b>	
Not during the past month	120 (62.1%)
Less than once a week	49 (25.3%)
Once or twice a week	17 (8.8%)
Three or more times during a week	7 (3.6%)
<b>During the past month, how often have you had trouble sleeping because of other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s) [Please fill the comment box too]</b>	
Not during the past month	148 (76.6%)
Less than once a week	15 (7.7%)
Once or twice a week	17 (8.8%)
Three or more times during a week	13 (6.7%)

<b>During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?</b>	
Not during the past month	184 (95.3%)
Less than once a week	3 (1.5%)
Once or twice a week	3 (1.5%)
Three or more times during a week	3 (1.5%)
<b>During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?</b>	
Not during the past month	150 (77.7%)
Less than once a week	26 (13.4%)
Once or twice a week	14 (7.2%)
Three or more times during a week	3 (1.5%)
<b>During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?</b>	
Not during the past month	78 (40.4%)
Less than once a week	43 (22.2%)
Once or twice a week	42 (21.7%)
Three or more times during a week	30 (15.5%)
<b>During the past month, how would you rate your sleep quality overall?</b>	
Very good	45 (23.3%)
Fairly good	120 (62.1%)
Fairly bad	25 (12.9%)
Very bad	3 (1.5%)
<b>Do you think the sleep pattern you just described was different before the COVID19 pandemic/ lockdown?</b>	
Strongly agree	50 (25.9%)
Agree	63 (32.6%)
Neither agree or disagree	32 (16.5%)
Disagree	28 (14.5%)
Strongly disagree	20 (10.3%)

### Sleep quality

During the past month 5 (2.1%) rated their sleep very poor, 33 (14.2%) had fairly poor sleep, while the rest had adequate sleep quality (Table 1).

### Sleep latency

Almost 80% could sleep within 30 minutes of going to bed; 32.9% could sleep in less than 15 minutes and 46.7% took 16-30 minutes.

### Sleep duration

Majority of the subjects (83.5%) could sleep for 6 hours or more and thus had adequate sleep during lockdown (Figure 3).

### Sleep disturbances

A quarter of respondents indicated sleep disturbances due to varying reasons; waking up in the middle of the night or early morning (25.8%) and trouble sleeping because of getting up to use the bathroom (24.1%). Sleep disturbances due to dyspnoea, cough/snore/feeling of too hot or cold, bad dreams and others were reported by a minor proportion of respondents (Table 1).

### Use of sleep medication

Only 6% of the respondents indicated use of sleep medication. Seven (3%) took medication less than a week, three (1.3%) once or twice a week and four (1.7%) more than thrice a week.

### Daytime dysfunction and loss of enthusiasm

Day time dysfunction was reported by less than 22% respondents; 12.9% had trouble less than a week, 6.9% once or twice a week and 2.1% more than thrice a week.

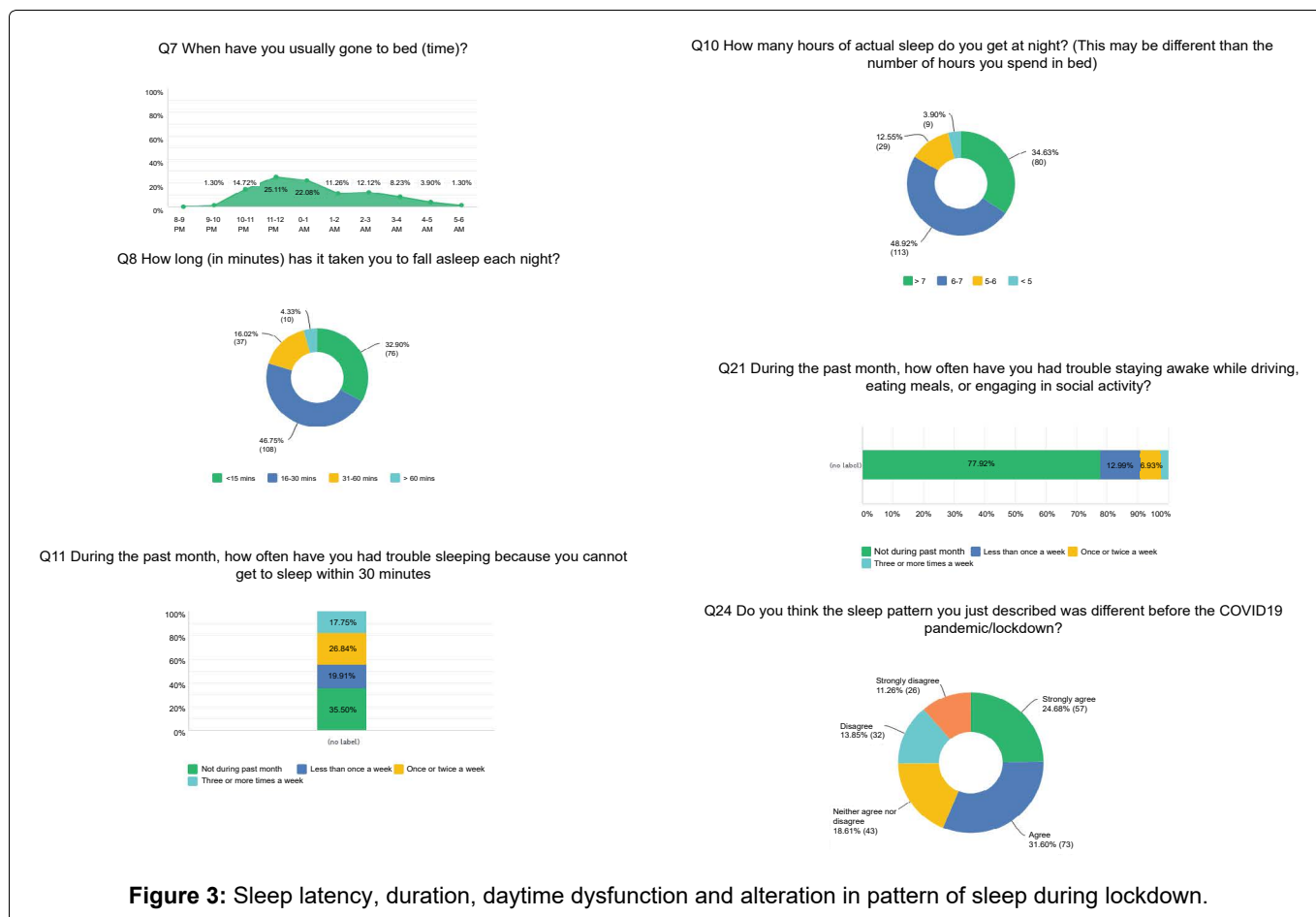
Loss of enthusiasm to get things done was reported by 61% respondents; 46 (19.9%) had trouble less than a week, 56 (24.2%) had trouble once or twice a week and 39 (16.8%) had trouble more than thrice a week.

### Change in sleep pattern after lockdown

130 (56.2%) believed that their sleep cycle had changed due to lockdown. 58 (25.1%) disagreed and 43 (18.6%) were not sure.

### Discussion

Present study indicates quite a substantial propor-



tion of subjects experience sleep disturbances during lockdown. Sleep is a phase of daily routine when body gets shut down for certain period to achieve normal physiological equilibriums. In normal sleep physiology we consider three parameters; 1) Sleep latency; 2) Sleep maintenance and quality; and 3) Duration of sleep. Our day to day physical and mental functions depends on adequacy of these three sleep parameters. Normal latency, duration and quality of sleep have been shown to be related with immunity [1], memory and hormonal related functions [2]. Disturbance in the sleep parameters results in various physical and psycho-behavioral disorders [3,4]. Hashizaki, et al. suggested that sleep habits are influenced by change in the temporal patterns of social activities/duties [2]. Glucose-PET studies in individuals with sleep deprivation have shown that after 24 hours of sustained wakefulness, the metabolic activity of the brain decreases significantly [3]. Sleep deprivation has also been implicated of increased heart rate variability [2]. The retino-hypothalamic tract allows light to influence the suprachiasmatic nucleus [2]. Since Suprachiasmatic nucleus responds to light and influences the circadian rhythm, a lack of exposure to daylight due to prolonged isolation indoors result in disruption of sleep cycle. Daytime sleepiness suggests fatigue which plays in important role in causation of Road Traffic Accidents and medical errors in healthcare professionals [2]. Disturbed circadian rhythm leads to increase in sleep maintenance resulting in sleep maintenance insomnia [5]. With a change in the circadian rhythm,

surprisingly there was a change in the duration of sleep too, contrary to what reported earlier by Hawkley LC, et al. [6]. Sleep latency was increased in a significant number of respondents. Normal sleep physiology depends on physiological, psychological, environmental, and socio-culture factors [6-9].

We are living in the middle of history's greatest sleep experiment yet. Television and mobile phones are always running, the Internet allows you to shop, work, be entertained and connected with the world 24 × 7. With the spread of Covid-19 and enforced lockdown people of all sectors are finding themselves under tremendous amount of anxiety and depression due to various reasons ultimately resulting in sleep disturbance. Our findings strongly suggest a change in sleep pattern since the enforced lockdown. Habits like television watching before going for night sleep and patterns of room partner/bed partner also found significant factors affecting sleep quality and duration [10].

A loss of enthusiasm was noted amongst a great chunk of the respondents suggesting sleep deprivation.

Disturbed sleep is often co-morbid with Nocturia [11]. Kim, et al. reported that scores suggesting poor quality of sleep on most subscales of the Pittsburgh Sleep Quality Index (PSQI) correlated with severity of Nocturia [12], Yoshimura, et al. found that nocturia was related specifically to more difficulty falling asleep [13] and Yu, et al. reported that nocturia was associated



with fewer total hours of sleep and difficulty falling back to sleep (sleep maintenance insomnia) [11].

Since poor sleep, increase sleep fragmentation, and later bedtimes with consistent wake-up time can seriously affect learning capacity, and overall performance. Bad sleep patterns also lead to mood and behavior changes like irritability and anger. Sleep hygiene is the current suggested option to improve quality of sleep and overall performance [14]. Sleep Hygiene practices had proven correlation with good perceived quality of sleep and performance [15].

## Strengths

We have taken care to carefully enroll subjects who did not have any extraneous factors that might have impacted the sleep patterns. Incomplete forms were excluded from the analysis. Survey data highlights that significant number of respondents experienced sleep disturbances during lockdown which may have adverse effects on immediate as well as long term health of the subjects. Awareness of such an issue is important for public, medical professionals and health policy makers as well and appropriate strategies/policies need to be drafted and implemented well in time so as to minimize sleep disturbances in masses.

## Limitations

The major limitation of our study is cross-sectional design of the study where we inquired about alterations in sleep patterns during prolong lockdown only. We didn't have information about the baseline sleep patterns of the respondents prior to lockdown. However, this kind of prolong lockdown worldwide was one of its kind in recent history of mankind therefore baseline information regarding sleep pattern of the respondents was almost impossible to document. Additionally, we did not inquire about psychological factors like anxiety towards safety of near or dear ones, job security, financial issues, physical separation from family members, education/training related issues and others which could have impacted the sleep patterns of the subjects. Despite excluding subjects with extraneous factors that might have impacted the sleep patterns we are not sure if information provided by the respondents was accurate in all the cases. It is quite possible sleep pattern of the respondent in our survey might have been altered due to influence of altered sleep pattern of other family members, e.g. spouse or children, which we didn't enquire about.

## Conclusion

Sleep plays a pivotal role in healthy functioning of the human body. Our findings suggest a significant change in the sleep quality of the respondents due to the Covid enforced lockdowns which may later lead to significant health problems. It is recommended that with all other precautions to prevent Covid-19 related illnesses, everyone should follow the sleep hygiene guidelines

which will be useful for immunity maintenance and better health.

## Acknowledgements

None.

## Funding Statement

None.

## Conflict of Interest

The authors declare that there is no conflict of interest.

## Contribution of Authors

All authors were involved in ideation, data collection and manuscript preparation. All authors agree with the submitted version of the manuscript, take responsibility for the content of the entire manuscript, and affirm that any queries related to any aspect of the same are appropriately managed.

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