



COVID-Somnia: How the Pandemic Affects Sleep/Wake Regulation and How to Deal with it?

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The year 2020 will be remembered for a cataclysmic event—i.e. the coronavirus disease (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 has personal, societal, and global health consequences. The world has stalled during this pandemic as it has compelled people to reduce their direct contact with each other and confined them in their homes, only to contact others maintaining a careful distance or through telecommunication facilities (distant socializing). This was a gross and unprecedented behavioral change. This also has changed the sleep schedule of a sizable population as evident by various surveys that report worsening of sleep quality during lockdown. It has been suggested that racial/ethnic minorities and other disadvantaged populations were disproportionately affected due to variety of reasons, such as poor living condition, poorer access to healthcare to name a few [1].

The lockdown has changed the routine of the people including the physical activity, eating habits, electronic usage and sleep habits [2]. Apparently, these factors have led to change in sleep habits and sleep quality. Increased sleep disturbances (both in terms of quality and quantity) and characteristic sleep changes were observed among global communities. Sleep disturbances during pandemic have been referred as COVID-somnia, a term used as a preferred euphemism to facilitate communication. Delay in bedtime and wake-time along with a reduction in total time spent in sleep during night was reported in the general population survey in India [3]. Daytime napping also increased, perhaps to overcome the deprivation of nighttime sleep (excessive daytime sleepiness) [3]. Delayed bedtime and wake-time

during lockdown has been ascribed to a paucity of social zeitgebers (time cues) [2]. Other factors namely the chronotype (or circadian typology, which is the propensity of an individual to sleep at a particular time during a 24 h period) and age were found to influence change in sleep pattern during lockdown. However, alteration in sleep-schedule and sleep-habits was not uniform across population and certain factors appeared to increase risk for the same. For example, shifting to later bed-time and wake time was greatest in the evening chronotypes and minimal in morning chronotypes; it was greater among younger compared to adults; and finally, larger among women [4].

Besides change in sleep schedule, the literature suggested worsening of sleep quality during lockdown [2, 3]. Since these studies were cross-sectional, cause and effect relationship could not be ascertained. It is easy to speculate that lockdown leads to emotional and psychological distress, uncertainties, and unemployment [5, 6]. Concepts like sleep reactivity suggest that different people respond differently to stressful situations. Those with high sleep-reactivity develop sleep disturbances. A study from Morocco reported high prevalence of anxiety, depression, and sleep disturbances during lockdown, but in the background of dysfunctional beliefs about sleep in a large proportion of the population [7]. It must be noted that like stress, sleep reactivity and dysfunctional beliefs are also not causative factors but merely a risk factor for the development of insomnia [8, 9]. Thus, prevailing circumstances had only limited role in the development of sleep disturbances in population. This is further evident by the fact that there was discordance between proportion of exposure to event and proportion of persons developing sleep disturbances.

It is possible that people with underlying biological vulnerability might have experienced the sleep-disturbance and change in sleep schedule during the COVID-19 pandemic. COVID-19 infection causes systemic inflammation leading to a surge in inflammatory mediators in the body that are known to influence sleep and vice-versa [10]. Systemic

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infection-related increase in the inflammatory mediators are known to increase the amount of NREM sleep and duration of sleep, perhaps in an attempt to save energy and counter the infection [10]. However, different infections have varying effects on sleep, some of them increase it while others reduce it owing to different effects on immune system [10]. That could be one reason that COVID-19 infection has led to insomnia and worsening of sleep quality rather than increment in sleep.

Not only the sleep quality has been affected during the COVID-19 pandemic, but pandemic could have led to emergence of sleep disorders as well. For example, a case report suggested that COVID-19 infection led to insomnia and restless legs syndrome that improved with abatement of infection [11]. Authors mentioned that systemic inflammation and hypoxemia contributed to the emergence of these symptoms. Though not reported formally, but clinical experience suggests that sleep remains disturbed even after recovery from COVID-19 in a sizable number of patients.

It must be noted that nearly 80% of subjects with COVID-19 infection are asymptomatic. Second seroprevalence study by the Indian Council of Medical Research has shown that nearly 88 million citizens above the age of 10 years have been exposed to COVID-19 till August 2020 [12]. Because of the systemic inflammation induced by SARS-CoV-2 infection, these subjects are at higher risk for the development of sleep problems. The SARS-CoV-2 virus can reach the central nervous system through nasal as well as hematogenous route [13]. Furthermore, inflammatory mediators present in the vascular space increase the permeability of blood–brain barrier that in turn facilitates the entry of viral proteins in the central nervous system. This is followed by several sequel e.g., structural and functional changes in the brain viz., microglial activation and neuronal inflammation, upregulation of oligodendrocytes and astrocytes, microangiopathy and, molecular mimicry leading to neuronal damage, to name a few [13]. SARS-CoV-2 virus preferentially affects the prefrontal cortex, basal ganglia, and hypothalamus in the brain, areas that are important for the regulation of sleep [13]. Hence, it is possible that high prevalence of sleep disturbances seen during COVID-19 could also be attributed to asymptomatic infection by the virus, rather than attributing it to social and emotional factors alone. However, this is just a speculation and needs further research.

Other evidence suggests association between sleep and SARS-CoV-2 infection is bidirectional. Sleep plays an important role in regulation of cellular as well as humoral immunity and sleep deprivation can reduce immune response [10]. Subjects with obstructive sleep apnea have been found to have an increased risk of contracting SARS-CoV-2 infection, getting hospitalized, and developing respiratory failure [14]. Thus, an adequate amount of optimal quality sleep appears an important factor to counteract

infection. However, any association between morbidity or mortality related to SARS-CoV-2 and insomnia or poor sleep quality during COVID-19 pandemic has not been reported yet. In this issue, Cardinali et al. [15] have persuasively argued as to why elderly persons are more susceptible to contract SARS-CoV-2 infection. Several factors have been discussed in this article that worsens sleep among the elderly, including aging of the circadian network, reduction of the amplitude of melatonin rhythm and advancement of shift with aging [15]. Besides this, melatonin is also known for its inflammatory, anti-oxidant, and immunoregulatory properties [15]. Is it possible that melatonin related mechanisms at least partly contribute to increased susceptibility to SARS-CoV-2 infection among elderly.

At a larger level, sleep medicine services have been impacted globally during the COVID-19 pandemic [14–16]. Considering the important association between sleep and SARS-CoV-2 infection, several societies have proposed guidelines to mitigate sleep disorders and using telemedicine facilities to manage patients during the pandemic. This issue contains two papers that discuss measures to be taken to provide sleep disorder services to patients during pandemic– [16, 17]. Readers may benefit from these guidelines, which will help them to understand, and manage sleep medicine services during the prevailing unprecedented condition. These guidelines focus on continuing the services related to sleep disorders amidst pandemic especially to the patients suffering from insomnia and obstructive sleep apnea. Considering high prevalence of these disorders, optimal management of these disorders is important during pandemic not only to reduce the risk of contracting SARS-CoV-2 infection, but also to reduce adverse health consequences related to same [18, 19].

In conclusion, there is paucity of literature describing an association between COVID-19 and sleep-disorders. This is an important area for research as the relationship appears bi-directional- improvement in sleep may be used to reduce impact of COVID-19 and vice-versa. The impact of COVID-19 infection on sleep in long-term needs to be investigated as anecdotal reports and clinical experience suggest appearance of sleep disorders in these patients. Resumption of sleep medicine services during pandemic is an important step in this aspect.

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