REVIEW ARTICLE

Alteration of sleep behavior among office workers and its physiological perspectives during lockdown with its future implication: A mini-review

Ankita Biswas, Subhashis Sahu*

ABSTRACT

People worldwide experienced diverse health issues due to the sudden pandemic outbreak, which changed their lifestyles and work patterns. Consequently, due to the switch from the traditional work schedule, there was a significant shift in office workers' work schedules, where "work-from-home" became the new normal. There is sporadic evidence regarding different physiological problems among the general population in this pandemic literature; however, very few studies have documented alterations of temporal behavior in office employees of corporate sectors. This present article reviewed and summarized existing research results that looked into the health consequences of the pandemic-induced new normal life and its effects on office workers' physical and mental health. This review will contribute to a deeper insight into the root issues of long-term sleep disturbances with the physical and mental health concerns that the epidemic has brought about in the corporate population.

Keywords: Sleep behavior, Sleep quality, Mental health, Office workers, Lockdown, Work from home, New normal.

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INTRODUCTION

The COVID-19 pandemic reached 1.7 billion individuals by March 26, reaching 3.9 billion by April, affecting over 50% of the global population.[1] Countries implemented lockdown measures to prevent COVID-19 spread, requiring work from home. These preventive measures have transformed global work practices, enabling job-hopping, flexibility, and clarity, shifting employees from traditional 9 to 5 to work-from-home (WFH) overnight. So far, post-pandemic, WFH has significantly expanded due to companies considering reducing office space requirements to lower operational costs. Apparently, it has become a trend with pros and cons that vary depending on the person and the nature of employment.

The pandemic has significantly impacted the global economy, leading to a significant slowdown and a drop in global stock indexes.[2] Many people committed suicide[3,4], and millions lost their employment.[5] The pandemic's economic and productive impacts vary across various work fields, posing threats to physical health, mental health, and resiliency. The #iorestoacasa decree[6] has led to drastic lifestyle changes, disrupting sleep-wake cycles, increased workload, stress, and anxiety among working populations, resulting in shortened time anchors and reduced external cues.[7,8] Indeed, multiple studies have shown that lockdown and its sedentary lifestyle are linked to numerous psychological health issues and sleep-related issues.[9-12] Sleep is a crucial mental health concern for health practitioners[13] due to its fundamental role in sustaining good mental and physical health, including social and spiritual behavior, optimal cognitive and psychological processing, and overall welfare[14-16], making a good night's sleep essential for everyone. [14, 17-19] Even though a link between adequate sleep and healthy behaviors was postulated [20, 21], individuals in this modern world face challenges in obtaining sufficient sleep [22] due to technology disruption. [23] Moreover, according to a study, the pandemic has intensified the widespread use of social media [11, 24], potentially leading to poor sleep quality. [25, 26]

However, a significant portion of today's population works in corporate settings, and they play a critical role in propelling the growth of any nation's economy. Consequently, they are in a situation where their traditional job setting has faded away, and a new blended work approach has begun, which can disrupt their physical and mental health and be detrimental to their overall health in the future, *i.e.*, on a long-term basis, affecting their job efficiency as well. This will gradually consume any country's entirety economic output. In accordance with that, the current study was developed and conducted as a review aiming to comprehend how sleep patterns and behaviors have changed as a consequence of the work-from-home policy and to answer crucial issues regarding the alteration of sleep behavior and its health implications among office workers of corporate sectors during the lockdown period.

Ergonomics and Occupational Physiology Laboratory, Department of Physiology, University of Kalyani, Kalyani, West Bengal, India.

***Corresponding author:** Subhashis Sahu, Ergonomics and Occupational Physiology Laboratory, Department of Physiology, University of Kalyani, Kalyani, Nadia, West Bengal, India. Email: skcsahu@yahoo.co.in

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Search Strategy

We did our best to comb through the research on chronobiological aspects and factors affecting office workers' sleep behavior in the context of the lockdown-induced new normal. Google Scholar, PubMed, ResearchGate, Willey Online Library, Semantic Scholar, and Elsevier Open Access Journals were the repositories from where all the research articles have been assembled and reviewed. We searched for research articles using MeSH terms such as COVID-19 pandemic, lockdown, work from home, office workers, sleep, sleep behavior, sleep quality, mental health, and screen time (Figure 1). We included a total of 24 articles that discussed sleep-related problems among office employees in the context of the lockdown-induced new normal (Table 1). Articles not published in peer-reviewed journals or journals not accessible online or not written in the English language, duplicate articles, as well as articles with a lack of scientific justifications, were excluded from the present study. The study comprised peer-reviewed English publications, including cross-sectional studies, observational studies, *etc.*, published between 2006 and 2022.

Alteration of circadian rhythm and sleep-wake cycle:

Circadian misalignment

Human work-rest cycles and sleep in twentieth-century societies result from tensions and dynamics between the opposing poles of an individual's internal biological time and external social time. It has been proposed that a misalignment between these two can cause "social jetlag" and "social sleep restriction," which refers to an alteration in bedtime schedules and time spent asleep on work days versus free days.[27] By using a large-scale quasi-experimental methodology, Blume *et al.*[28] examined the impacts of the initial phase of the COVID-19 lockdown on the interaction between external (social) and internal (biological) cycles along with sleep throughout a six-week period (from mid-March to end-April 2020) in three European societies (Austria, Germany, Switzerland). However, they discovered that the constraints minimized the misalignment between internal (biological) and external (social) sleep-wake timing, as indicated by significantly decreased social jetlag and social sleep restriction, with a concurrent rise in sleep length.

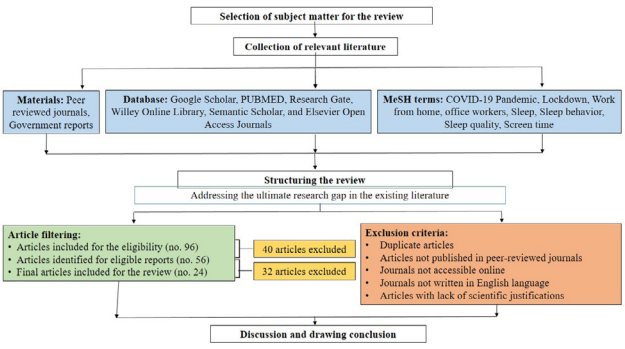

Figure 1: Schematic diagram of the search strategy of the review

Effect on sleep behavior

Several studies found that this unfamiliar condition also contributed to a substantial rise in self-perceived strain, which was associated with the depletion in sleep quality. According to Touitou *et al.*,[29] 75% of the workforce in developed nations work during the night and their circadian system can be disrupted due to exposure to nighttime artificial light. These adverse consequences may be alleviated by exposure to natural daylight and physical exercise. The new normal has affected individuals' levels of physical activity and sedentary behavior due to their altered patterns of employment and recreation. According to multiple reports, periods of lockdown imposed new normal can enhance sedentary behavior.[30-33] This sedentary behavior negatively correlates with physical and mental health[34-36] and social outcomes.[37] The 'work-from-home' job policy has predisposed workers to spend more hours sitting, leaning, or reclining at work. Besides that, the extended working hours can also be associated with prolonged screen time exposure.[25] A study has shown that excessive screen time can be linked to poor sleep through various mechanisms, including nighttime exposure to bright light that may restrict hormone melatonin production and the displacement of other activities necessary for sleep.[38] In a cross-sectional study aiming to find out the relationship between self-reported sleep patterns with digital media use among 254 male students by Orzech *et al.*,[39] it was observed that screen time exposure for a prolonged period of time was linked to decreased total sleeping time as well as later bedtime. Research has also revealed that reduced availability of natural light, lowered usual 'time anchors,' such as workers arriving and leaving the office and workers visiting recurring social gatherings or working out in the gym, significantly reduced external cues to keep them on time and regulate their sleep/wake cycle and many other circadian rhythms.[40] According to Leone *et al.*,[41] daylight exposure and social cues underwent major changes due to the pandemic-induced home confinement. Additionally, the chronotype was delayed, which could ultimately lead to desynchronization due to a weak light-dark cycle. Because of the pandemic, work-from-home is now more prevalent. There was a change to a later bedtime and waking time, resulting in a reduction in nighttime sleep and a rise in daytime naps, according to a study conducted by Gupta *et al.* [42] among 958 Indian populations to identify their sleep experience, schedules, and other parameters to study the alterations associated with the lockdown. However, these changes were noticeable across different occupations but primarily impacted working people from home. Kocevska *et al.*[43] conducted a study with 667 adult participants from the Netherlands to explore the impacts of the pandemic-induced measures on the quality of sleep throughout various levels of pre-pandemic sleep problems. The Netherlands Sleep Registry (NSR) participants were asked to complete a weekly online survey that included validated scales measuring the subjective likelihood of major stressors, insomnia, and sleep

times. It has been reported that nearly 20% of pre-pandemic good sleepers had poorer sleep during the lockdown measures. As a result, the study concluded that COVID-19 lockdown measures, such as home isolation, deteriorated sleep issues in pre-pandemic good sleepers. Barone Gibbs *et al.* conducted a follow-up study to investigate the long-term impact of home confinement on work patterns, lifestyle, health, and behavior of office workers throughout pandemic-induced work-from-home confinements. They used analysis of covariance (ANCOVA) to compare outcomes before and after the work-from-home policy and to determine if the alteration in consequences deviated from remote working hours. According to the study, there have been significant changes to work strategies, with 72% switching to WFH, showcasing negative shifts from before to during work from home, including a 1.3 (3.5)-h rise in the sedentary behavior during work-free days and 0.7 (2.8)-point worsening of sleep quality. Furthermore, it was reported that the wake time was prolonged by 41 (61) minutes or even more among home-confined office workers. [44]

Sleep disorders

Many people decided to work or learn from home as a result of pandemic-related prophylactic measures like social exclusion and government-mandated isolation. Additionally, those who were susceptible to delayed sleep-wake phase syndrome may be affected by this changed pattern, as reported by Bryson. [45] A cross-sectional study using a web-based survey from Italy with 400 participants, including 307 students and 93 university administration staff members, was conducted to explore the effects of home confinement during the pandemic on sleep schedule along with sleep disturbances. The results showed an increase in bedtime hours, sleep latency, and wake-up time between before and during the COVID-19 emergency, as well as a worsening of sleep quality and insomnia symptoms. The impact of the delay in sleep onset time and sleep offset time was mostly visible in young individuals during the lockdown. However, the study found that workers had a prevalence of sustained insomnia of 24% before the lockdown, which increased dramatically during the lockdown to 40%, whereas workers with difficulty initiating sleep were only 15%, which hiked to 42%.[46] Likewise, several cross-sectional studies have been conducted in India to explore the impact of pandemic-induced "work-from-home" job strategies on the health and well-being of home-confined office workers. It was reported that there might be associations between sedentary behavior and sleep behavior during "work-from-home."[47] In addition to this, the quality and quantity of sleep have been markedly worsened due to the misalignment of the circadian chronotypes of office workers in corporate sectors, which can contribute to their mental health and well-being.[25,48-51]

Mental health impairment

Mass unemployment has been caused by the unanticipated measures undertaken to close down the majority of economic sectors during the spread of COVID-19.[52] The

Table 1: Alteration of circadian rhythm and sleep-wake cycle and mental health impact

			Summary	
#	*Authors*	*Subjects*	*Methodology*	*Outcomes*
1	Jacob *et al.* (2020) [30]	902 Home-confined adults	Self-reported physical activity level, Beck anxiety and depression inventory, the short Warwick-Edinburgh mental well-being scale	Increased sedentary behavior during the lockdown and sedentary activity were negatively linked to psychological health.
2	Schuch *et al.* (2020) [31]	937 Home-confined adults	Self-reported reported physical activity level, beck depression and anxiety inventories (BDI and BAI),	Reduced physical activity during lockdown was linked to increased symptoms of anxiety and depression.
3	Gallè *et al.* (2020) [32]	384 Home confined adults	Self-structured 7-point rating scale regarding demographic information, pandemic status as well as control measures and lifestyle adopted during lockdown	Reduced physical activity
4	Tremblay *et al.* (2011) [33]	232 studies, a total of 983,840 participants	Meta-analysis regarding sedentary behavior and body composition	Daily excessive screen time exposure was linked to poor physical and mental health
5	Desai *et al.* (2020) [37]	1537 home-confined Indian adults	Patient health questionnaire-9 (PHQ-9) and seven-item General Anxiety Disorder-7 (GAD-7) questionnaires	Participants were found to be prone to psychological ailments.
6	Majumdar *et al.* (2020b) [25]	204 home-confined working population	Munich chronotype questionnaire (MCTQ), self-structured screen exposure time questionnaire, Epworth sleepiness scale (EWS), center for epidemiological studies depression scale (CES-D)	Extended working hours can also be associated with prolonged screen time exposure and sleep deprivation, Reduced sleep quality with increased daytime sleep. Moreover, Job insecurity may affect mental well-being, increased job demands and social isolation were associated with work stress

7	Leone *et al.* (2020) [41]	1021 participants	Quantitative sleep study, social jetlag, and chronotype	A delayed chronotype was found
8	Gupta *et al.* (2020) [42]	958 home-confined Indian populations	Questionnaire related to a sleep schedule, insomnia severity index - 4, perceived stress scale - 4, patient health questionnaire - 4, and international physical activities questionnaire	later bedtime and waking time, reduction in nighttime sleep, and increase in daytime naps
9	Kocevska *et al.* (2020) [43]	667 adults in the Netherlands	Insomnia severity index (ISI)	20% of pre-pandemic good sleepers had poorer sleep during the lockdown measures
10	Barone *et al.* (2021) [44]	112 home-confined working population	Pittsburgh sleep quality index (PSQI)	Worsening sleep quality and delayed wake time
11	Micheletti *et al.* (2021) [46]	828 Italian workers	Ad hoc questionnaire to determine the perception of any change in sleep quality	Reduced sleep quality
12	Marelli *et al.* (2021) [47]	93 home-confined Italian workers	PSQI and ISI	Worsening insomnia symptoms
13	Dwivedi *et al.* (2021) [48]	251 home-confined Indian workers	A self-reported questionnaire titled "Altered daily behavior: before lockdown vs. during lockdown."	Delayed sleep-wake cycle, increased daytime sleep, and increased sedentary behavior during "work-from-home"
14	Banthiya *et al.* (2021) [49]	808 home-confined Indian adults	PSQI	Prevalence of poor sleep quality
15	Sinha *et al.* (2020) [50]	1511 home-confined Indian adults	Mid-sleep-time (MST) and social jetlag (SJL)	Delayed mid-sleep time, increased social jet lag among younger and female subjects
16		676 home-confined Indian workers	Sleep data were assessed	Increased use of electronic gadgets affects sleep latency and sleep quality
17	Majumdar *et al.* (2022) [52]	146 home-confined Indian workers	MCTQ, EWS, CES-D	Altered sleep behavior and negative correlation between sleep duration and depressive symptoms
18	Chen *et al.* (2021) [53]	_	Review article	Mass unemployment and its subsequent mental health impairment were found to be triggered by the unanticipated measures undertaken during the lockdown.
19	Zhai *et al.* (2015) [54]	_	Meta-analysis	Sedentary behavior can raise the chance of developing depression.
20	Chopra *et al.* (2020) [55]	995 Indian adult population	A validated questionnaire was used to identify the alteration in lifestyle-related behavior	Prevalence of stress and anxiety were found among one-fourth of the total population due to increased sedentary behavior
21	Huang *et al.* (2020) [56]	_	Meta-analysis	Sedentary behavior was positively associated with the risk of depressive symptoms
22	FE Online (2020) [57]	Home-confined Indian working population	News article	The conflict between their personal and professional lives may increase stress
23	Gonzalez-Mulé and Cockburn (2020) [58]	3148 workers in the United States	Brief test of adult cognition (MIDUS 2), World mental health organization composite diagnostic interview-short form	A stronger link was found between depression and employee fatality in terms of job autonomy, work expectations, and cognitive functions to deal with stressful situations.
24	Xiao *et al.* (2020) [59]	988 home-confined American workers	5-point Likert-type scale, Linear regression, multinomial logistic regression, and chi-square tests	Sedentary behavior, limited interaction with colleagues, the presence of children and interruptions while working, altered working hours, workstation alteration, *etc.*, were all correlated with the decreased overall physical and mental health of workers during WFH

fear of job instability caused by the lockdown also affected the mental well-being of home-confined office workers.[25] According to Zhai *et al.,* sedentary behavior, such as using e-gadgets like computers, was found to be positively correlated with the likelihood of depressive symptomatology.[53] These sedentary behaviors may contribute to the risk of depression by interfering with direct communication and diminishing social connections or by reducing possible time to indulge in physical workouts, which can mitigate depressive symptomatology.[54, 55] According to one study, Indian office workers who were working from home due to the new norms were under stress because of limited social contact. Moreover, considering the conflict between their personal and professional lives, more than 40% of Indian workers felt stressed.[56] Another study conducted at Indiana University in the United States divulged that there are three contributing factors, namely stress, less control over work, and decreased cognitive performance, which may be impairing mental health, leading to an increased risk of depression and even death. There is a stronger link between depression and employee fatality in terms of job autonomy, work expectations, and cognitive functions to deal with such stressful situations.[57] As reported by Majumdar *et al.*, work-from-home employees clearly had less autonomy, increased job demands, and a lack of suitable infrastructures to deal with work stress. Moreover, they were disconnected and isolated from their workplace.[25] Likewise, to comprehend the impacts of societal, mental, and physical factors on the health and well-being of 988 office workers during the pandemic-induced work-from-home period, conducted a cross-sectional questionnaire study where they used linear regression, multinomial logistic regression, and chi-square tests to validate contributing factors linked with the physical as well as mental health well-being and the number of new health problems. The study revealed that loss of physical activity, eating behavior, limited interaction with colleagues, the presence of children and interruptions while working, altered working hours, workstation alteration, etc., were all correlated with workers' decreased overall physical and mental health during WFH.[58]

CONCLUSION

This article aimed to review and summarize findings regarding the alteration of sleep behavior, such as sleep patterns and sleep quality, and its subsequent mental health impact on home-confined office workers of corporate sectors during the pandemic-induced new normal. Here, we highlighted the prevalence and underlying causes of erratic sleep patterns and its future implications during the lockdown. It was observed from the majority of the findings that pandemic-induced lockdown and work-from-home job patterns could affect office employees more on sleep behavior and their mental well-being due to erratic work schedules, extended working hours, and the alteration of such temporal behavior could be occurred due to societal isolation, dependency upon digital use, job insecurity, and domestic interruptions, *etc*. However, this review has certain limitations, i.e., including solely English-language articles could lead to English language bias; secondly, the number of included research articles was limited, which may weaken the credibility of the evidence of the review. While some studies have been done on the present state of sleep behavior the long-term implications of this new normal life on the office workers of corporate sectors are still unclear since it is a recent occurrence. Therefore, learning from past epidemics requires a detailed follow-up study on this context and preparing ourselves to deal with future health crises.

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CONFLICTS OF INTEREST

Nil.

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PEER-REVIEWED CERTIFICATION

During the review of this manuscript, a double-blind peer-review policy has been followed. The author(s) of this manuscript received review comments from a minimum of two peer-reviewers. Author(s) submitted revised manuscript as per the comments of the assigned reviewers. On the basis of revision(s) done by the author(s) and compliance to the Reviewers' comments on the manuscript, Editor(s) has approved the revised manuscript for final publication.