



# Reforming Sleep Health: A Need to Focus on Sleep Health Policy to Reduce Disease Burden and Promote Health Equity and Equality

Ravi Gupta<sup>1</sup> · Seithikurippu R. Pandi-Perumal<sup>2</sup> · Hruda Nanda Mallick<sup>3</sup>

Published online: 29 November 2022

© The Author(s), under exclusive licence to Springer Nature Singapore Pte Ltd. 2022

“Reform is not a onetime action; it is a permanent attitude”  
- António Manuel de Oliveira Guterres, UN Secretary-General, 2017

Across the human lifespan, sleep duration varies between individuals and populations. As we grow and mature, our sleep patterns, composition, and architecture drastically change. An average adult habitually spends around one-third of their life in sleep, while newborns spend ~ 16 h of sleep in 24 h. Time spent in sleep reduces as we age, but the need for sleep remains constant. The sleep–wake cycle is influenced by hosts of other factors viz., social, economic, cultural, ecological, psychological, and environmental, besides psychiatric and other medical disorders [1].

Sleep is an important physiological process in itself for the body and partial and total sleep deprivation is associated with morbidity as well as mortality [1]. Not only short sleep but also prolonged sleep has been found to have similar results emphasizing the fact that like other physiological processes e.g. blood pressure, heart rate, and blood sugar to name a few, sleep duration has to fall a narrow range to maintain good health [2].

Subjective and objective sleep studies in small-scale subsistence societies have expanded our knowledge of the

variation among cross-cultural sleep patterns, revealing the adaptability and the natural sleep–wake pattern of human sleep. As sleep duration is traded in exchange for both leisure or success, shortened sleep duration and delayed sleep–wake phase have almost become a norm in the modern world, which are known to be associated with an increase in blood sugar, circulating insulin levels, and resulting in insulin resistance and weight gain [1, 3, 4]. Sleep deprivation also increases the risk for psychiatric disorders viz., depression, anxiety, substance use disorder, dementia, and other medical disorders e.g., hypertension, coronary artery disease, atherosclerosis, and stroke to name a few through various intertwining pathways [5]. As a result, various sleep disorders such as sleep apnea, insomnia, circadian rhythm sleep disorders, sleep-related movement disorders, parasomnias, and hypersomnia can occur. These sleep disorders increase the risk of the psychiatric and other medical disorders mentioned above, resulting in a vicious cycle that leads to poor health [6–9].

In modern 24-h society, when a sizeable portion of the population across all age groups is chronically sleep deprived, sleep disturbances may be one of the factors contributing to the growth in the prevalence of type 2 diabetes mellitus (T2DM), coronary artery disease (CAD), cancer, and depression [1, 10–12]. Considering the bidirectional relationship between medical disorders and sleep disorders, it is likely that the incidence of sleep disorders could also be showing an increasing trend. However, this has never been examined systematically as sleep disorders remain ignored category for the global as well as national regulatory agencies.

Data from cross-sectional studies suggested that nearly 425 million people across the globe are suffering from obstructive sleep apnea (OSA) with the greatest number in China followed by the United States of America, Brazil, and India [13]. Similarly, nearly half of the university students were found to suffer from insomnia in the South-East Asia (ASEAN) region [14]. World has experienced a major

---

✉ Seithikurippu R. Pandi-Perumal  
pandiperumal2022@gmail.com

Ravi Gupta  
sleepdoc.ravi@gmail.com

Hruda Nanda Mallick  
drhmallick@yahoo.com

<sup>1</sup> Department of Psychiatry and Division of Sleep Medicine, All India Institute of Medical Sciences, Veerbhadra Marg, Rishikesh 249203, India

<sup>2</sup> Saveetha Medical College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077, India

<sup>3</sup> Faculty of Medicine and Health Sciences, SGT University, Gurugram, India

pandemic since 2020 which brought the world to a standstill for a reasonable period and resulted in a loss of productivity, and economy in addition to that adverse consequences on human health and untimely deaths. Even though the pandemic was started because of the viral agent, sleep disorders showed a close association with it. OSA was found to increase the risk for SARS-CoV-2 infection whereas insomnia appeared to result from it [15].

Undiagnosed, underdiagnosed, and untreated sleep disorders have personal, societal, and public-health consequences. Individual effects include poor performance (e.g. academic, sports), poor quality of life, increased utilization of healthcare resources for other medical disorders as discussed above, suicide, loss of wages, reduced productivity, work-absenteeism, and chances of injury, disability, or loss of life due to industrial as well as motor vehicle accidents [16, 17]. From the public health point of view, reduced individual productivity culminates in overall hampered economic growth, greater expenditure towards healthcare services, and loss of innocent lives because of vehicular accidents. The list of accidents that are attributed to poor sleep health is long starting from three-mile island, challenger explosion, Exxon oil spill, the American Airline Flight 1420 crash, Hoboken train crash, and Air India Flight 812 crash, to name a few [18, 19]. Reports suggest that nearly 40% of road traffic accidents occur due to poor sleep health and two third pilots in India report falling asleep in the cockpit [19, 20]. The estimated costs of untreated insomnia and sleep apnea fall in the range of billions of US dollars per annum [16, 17]. Fortunately, the picture is not all grim and a silver lining is apparent backed by the cost–benefit analysis which has shown that optimal treatment of insomnia and OSA reduce healthcare, economic, social, and global disease burden to a great extent [16, 17].

As already discussed, sleep duration and timing are influenced by social, economic, cultural, ecological, psychological, and environmental, besides psychiatric and other medical disorders [1]. Fortunately, both these factors are modifiable and thus can help in reducing economic and public-health burdens arising not only out of sleep disorders but also associated with other medical disorders. But to attain that, sleep disorders should be given priority in global as well as national healthcare programs and policies.

Considering the grave consequences of sleep disorders, sleep health must be addressed to bring about health equity and equality among the population divided by race, socioeconomic status, and other determinants [21]. Sleep health aims to improve regularity, timing, and duration of sleep ensures good efficiency and satisfaction from sleep, and ultimately aims to promote alertness during the waking period [1]. Concepts of primary and secondary preventive measures also apply to sleep disorders. This may be addressed through awareness campaigns, and environmental changes

e.g., addressing noise, light, air, and light pollutions, improving living conditions; improving opportunities for optimal treatment of sleep disorders through human resource development in Sleep Medicine, infrastructure development in terms of sleep laboratories and accessibility to treatment for OSA; and through regulatory measures for promoting sleep viz., addressing to balance sleep-work time, incentivizing sleep-health promotion programs and avoiding commercial driving and pilot licenses to persons suffering from untreated sleep disorders [21].

South-East Asia (including India and China) is home to nearly half of the world's population and is still considered a developing region. Environmental conditions in these countries are concerning, and socioeconomic disparities are severe, paving the way for poor sleep health and its medical, societal, and economic consequences [21, 22]. If we want to improve our citizens' overall health, we must prioritize sleep health through a variety of measures [23]. Therefore, a multi-pronged approach is required, with coordination among various stakeholders (e.g. inclusion of governmental and non-governmental organizations (NGOs), citizenship charters, or community engagement groups, as well as patient groups). This is best accomplished by creating a framework for a sleep-health policy that addresses various aspects of sleep health across age and sex [1, 22]. This must include, but are not limited to school start time, working hours (duration, and timing), shiftwork (e.g. night shift—reverse rotating shifts, motor vehicle accidents (MVAs) and traffic safety.

What we need is solid sleep-health reform. This cannot be accomplished solely through the efforts of scientists who can generate data on the negative effects of poor sleep health or data showing how improving sleep health improves overall health or through the efforts of existing sleep physicians who provide care to individual patients. It takes the political will for policymakers (bureaucrats and politicians) to initiate and sustain dialogues with professional scientific bodies and sleep-health experts.

**Data availability** Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

## References

1. Grandner MA, Fernandez F-X. The translational neuroscience of sleep: a contextual framework. *Science*. 2021;374:568–73.
2. Chaput J-P, Dutil C, Featherstone R, Ross R, Giangregorio L, Saunders TJ, Janssen I, Poitras VJ, Kho ME, Ross-White A, Carrier J. Sleep duration and health in adults: an overview of systematic reviews. *Appl Physiol Nutr Metab*. 2020;45(10 (Suppl. 2)):S218–31.

3. De La Iglesia HO, Fernández-Duque E, Golombek DA, Lanza N, Duffy JF, Czeisler CA, Vasegna CR. Access to electric light is associated with shorter sleep duration in a traditionally hunter-gatherer community. *J Biol Rhythms*. 2015;30(4):342–50.
4. Martins AJ, Isherwood CM, Vasconcelos SP, Lowden A, Skene DJ, Moreno CR. The effect of urbanization on sleep, sleep/wake routine, and metabolic health of residents in the Amazon region of Brazil. *Chronobiol Int*. 2020;37(9–10):1335–43.
5. Besedovsky L, Lange T, Haack M. The sleep-immune crosstalk in health and disease. *Physiol Rev*. 2019;99(3):1325–80.
6. Fang H, Tu S, Sheng J, Shao A. Depression in sleep disturbance: a review on a bidirectional relationship, mechanisms and treatment. *J Cell Mol Med*. 2019;23(4):2324–32.
7. Tietjens JR, Claman D, Kezirian EJ, De Marco T, Mirzayan A, Sadroonri B, Goldberg AN, Long C, Gerstenfeld EP, Yeghiazarians Y. Obstructive sleep apnea in cardiovascular disease: a review of the literature and proposed multidisciplinary clinical management strategy. *J Am Heart Assoc*. 2019;8(1): e010440.
8. Uddin MS, Tewari D, Al Mamun A, Kabir MT, Niaz K, Wahed MI, Barreto GE, Ashraf GM. Circadian and sleep dysfunction in Alzheimer's disease. *Ageing Res Rev*. 2020;1(60): 101046.
9. Simon EB, Vallat R, Barnes CM, Walker MP. Sleep loss and the socio-emotional brain. *Trends Cogn Sci*. 2020;24(6):435–50.
10. Liu J, Ren ZH, Qiang H, Wu J, Shen M, Zhang L, Lyu J. Trends in the incidence of diabetes mellitus: results from the Global Burden of Disease Study 2017 and implications for diabetes mellitus prevention. *BMC Public Health*. 2020;20(1):1–2.
11. Ralapanawa U, Sivakanesan R. Epidemiology and the magnitude of coronary artery disease and acute coronary syndrome: a narrative review. *J Epidemiol Global Health*. 2021;11(2):169.
12. Liu Q, He H, Yang J, Feng X, Zhao F, Lyu J. Changes in the global burden of depression from 1990 to 2017: findings from the Global Burden of Disease study. *J Psychiatr Res*. 2020;1(126):134–40.
13. Benjafield AV, Ayas NT, Eastwood PR, Heinzer R, Ip MS, Morrell MJ, Nunez CM, Patel SR, Penzel T, Pépin JL, Peppard PE. Estimation of the global prevalence and burden of obstructive sleep apnoea: a literature-based analysis. *Lancet Respir Med*. 2019;7(8):687–98.
14. Chowdhury AI, Ghosh S, Hasan MF, Khandakar KA, Azad F. Prevalence of insomnia among university students in South Asian Region: a systematic review of studies. *J Prev Med Hyg*. 2020;61(4):E525.
15. Pataka A, Kotoulas S, Sakka E, Katsaounou P, Pappa S. Sleep dysfunction in COVID-19 patients: prevalence, risk factors, mechanisms, and management. *J Personaliz Med*. 2021;11(11):1203.
16. Taddei-Allen P. Economic burden and managed care considerations for the treatment of insomnia. *Am J Manag Care*. 2020;26(4 Suppl):S91–6.
17. Morsy NE, Farrag NS, Zaki NF, Badawy AY, Abdelhafez SA, El-Gilany AH, El Shafey MM, Pandi-Perumal SR, Spence DW, BaHammam AS. Obstructive sleep apnea: personal, societal, public health, and legal implications. *Rev Environ Health*. 2019;34(2):153–69.
18. Available at <https://www.somnologymd.com/2019/11/disasters-caused-by-lack-of-sleep/>. Last accessed on 15 Nov 2022
19. Available at <https://www.telegraph.co.uk/world-news/2022/09/23/two-thirds-indian-pilots-admit-falling-asleep-cockpit/#:~:text=In%202010%2C%20an%20Air%20India,of%20the%20two%20hour%20flight>. Last accessed on 15 Nov 2022
20. Available at <https://www.thehindu.com/news/national/kerala/sleep-deprived-drivers-responsible-for-40-of-road-accidents-say-transport-officials/article61629032.ece> Last accessed 15 Nov 2022
21. Hale L, Troxel W, Buysse DJ. Sleep health: an opportunity for public health to address health equity. *Annu Rev Public Health*. 2020;2(41):81.
22. Accessed at <https://frontline.thehindu.com/dispatches/india-ranks-at-the-bottom-in-a-list-180-countries-in-the-2022-environmental-performance-index/article65497256.ece> on 13 Nov 2022
23. Akhtar N, Mallick H. Recommendations for a National Sleep Policy in India. *Natl Med J India*. 2019;32:59–60.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.